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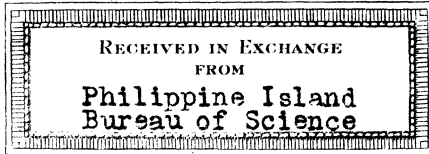
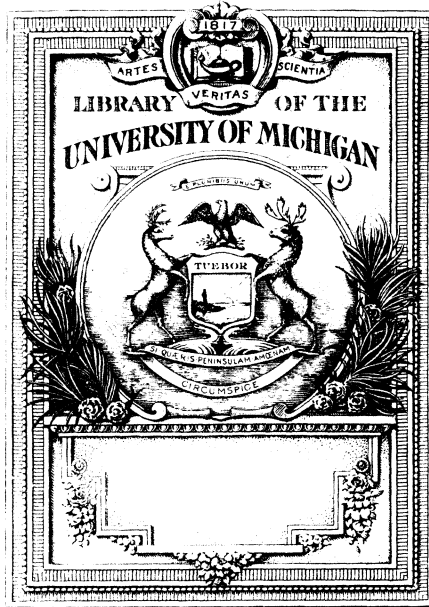
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THE PHILIPPINE JOURNAL OF SCIENCE

VOL. 72

MAY-JUNE, 1940

Nos. 1-2

THE LONGICORN BEETLES OF HAINAN ISLAND

COLEOPTERA: CERAMBYCIDÆ¹

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EIGHT PLATES

The present report is in the nature of a classification of the longicorn, or long-horned, beetles hitherto collected on Hainan Island, as far as available to the writer. A large part of the material on which the work has been based is included in the collections of the Lingnan Natural History Museum of Lingnan University, Canton, made on various expeditions, principally by F. K. To in 1932 and 1935, by Prof. W. E. Hoffmann, Mr. O. K. Lau, and Dr. F. A. McClure in 1932, and by the Fifth Hainan Island Expedition of the University in 1929, as well as on collections made by myself on my trip⁽³⁴⁾ to the island during the summer of 1935. The remainder of the material studied includes, among others, part of the collection made by Mr. J. Whitehead in 1899, and the specimens collected by Commander G. Ros in the spring of 1936.

A list of localities is given at the end, in addition to the map, in order to facilitate the identification of place names used.

I am deeply grateful to Professor W. E. Hoffmann, director of the Lingnan Natural History Survey and Museum of Lingnan University, for enabling me to make this study. To Dr. K. G. Blair, of the British Museum of Natural History, I am greatly

¹ Contribution from the Lingnan Natural History Survey and Museum of Lingnan University, Canton, China.

indebted for sending me Hainan specimens for study, including some of Whitehead's material, as well as for kindly comparing specimens for me with types in the British Museum. I am likewise indebted to the Reverend Père Octave Piel, of the Musée Heude, Université l'Aurore, Shanghai, for generously submitting to me for study the specimens collected by Commander Ros. I wish also to express my deep appreciation to Mr. W. S. Fisher, of the United States National Museum, and Drs. E. C. van Dyke and E. Gorton Linsley, of the University of California, for coöperation extended during the course of this study. Dr. F. A. McClure has very kindly supplied information concerning localities in Hainan.

The type specimens of the new species are deposited in the United States National Museum in Washington, D. C.; the Lingnan Natural History Museum in Canton, China; the California Academy of Sciences in San Francisco; the British Museum in London; and the Musée Heude, Université l'Aurore, Shanghai. The holotypes in the California Academy of Sciences are placed on loan deposit as part of my own collection, pending the final deposition of the latter.

HISTORICAL

The first paper on the Cerambycidae of Hainan Island, and the only previous paper to deal with them exclusively, was published by Gahan⁽¹⁹⁾ in 1900, and was based on the specimens collected by J. Whitehead on the island during the preceding year. In that paper the following 24 forms were listed, 22 of which were identified, and 6 (here preceded by asterisks) described as new species:

- | | |
|--|---|
| * <i>Ægosoma hainanensis</i> Gahan. | <i>Melanauster chinensis</i> Först. |
| <i>Ægosoma marginale</i> (Fabr.). | * <i>Melanauster macrospilus</i> Gahan. |
| <i>Philus antennatus</i> Saund. | <i>Coptops polyspila</i> Pasc. |
| <i>Dialeges undulatus</i> Gahan. | <i>Olenocamptus bilobus</i> (Fabr.). |
| <i>Ceresium sinicum</i> White. | * <i>Niphona Hookeri</i> Gahan. |
| <i>Eurybatus 10-punctatus</i> Westw. | <i>Pterolophia annulata</i> Chevr. |
| <i>Clytanthus douei</i> Chevr. var. | <i>Zotale lineata</i> (Gahan). |
| <i>Chlorophorus annularis</i> (Fabr.). | <i>Sybra posticata</i> Gahan. |
| <i>Xylotrechus quadripes</i> Chevr. var. | <i>Serixia sedata</i> Pasc. |
| <i>Monohammus bimaculatus</i> Gahan. | <i>Serixia</i> sp. |
| * <i>Pelargoderus apicalis</i> Gahan. | * <i>Astathes cyanoptera</i> Gahan. |
| * <i>Melanauster similis</i> Gahan. | <i>Oberea</i> sp. |

In addition was mentioned an undescribed species of a new genus allied to *Merionæda*, which has been sent me by Dr. Blair and is herein described as a new species of *Kunbir*. A

few changes in Gahan's identifications are also proposed in the present work. "*Clytanthus douei* Chevrolat var." may possibly be one of the two species of *Chlorophorus* herein named.

Since the publication of Gahan's paper no new species have been described from the island, and only two additional species have been recorded: *Paraphrus granulatus* Thomson by La-meere(43) in 1911, and *Æolesthes sinensis* Gahan by Liu(49, p.110) in 1934. As to the correctness of the latter identification, however, I am uncertain.

PHYSICAL FEATURES OF HAINAN

Hainan is a large, though little-known island, occupying an important place in the Gulf of Tonkin (Tongking) in the South China Sea, just south of the southern extremity of China, which, in the form of the Luichow Peninsula, approaches to within 25 kilometers of the island. Hainan lies a few hundred kilometers east of Tonkin, northern French Indo-China. The area of the island is in the neighborhood of 35,800 square kilometers (14,000 square miles), and its greatest length is about 290 kilometers (180 miles), in a southwest-northeast direction. Hainan extends from 18° 9' to 20° 8' north latitude and 108° 36' to 111° 3' east longitude, being a little south of Formosa, Hawaii, and Lower California, with the middle of the island just south of the northern end of Luzon. Though similar to Formosa in area and in relation to the continent, the island is much less mountainous and less heavily forested than the latter, and in some respects seems poorer in its fauna, in spite of its more tropical location.

The northern portion of Hainan, and the northwestern coastal area, are largely level, being partially cultivated, and in part almost desertlike, with low grass and scattered palms. The central and southern parts of Hainan are mountainous, with several long ranges extending in different directions. The highest mountains are a little less than 2,000 meters (6,500 feet) in altitude, and are covered with dense jungle, at least on their upper slopes. There are no volcanoes on the island, though there are a few low eroded cones, "The Hummocks," near the northern end of the island. There are four principal rivers, emptying into the ocean on as many sides of the island, and all originating in the mountains of the central part.

The climate is tropical, with high humidity and heavy rains, particularly those brought by the summer monsoons and typhoons from the east and southeast, across the Philippines and

the South China Sea. The climatic conditions differ considerably in the extreme southern part of the island, which is much warmer, with more distinct wet and dry seasons, than the central and northern sections, and this part apparently possesses a fauna distinctively different from that of the rest of the island. Unfortunately not much material is available from the southernmost portion.

ZOOGEOGRAPHY

Hainan is distinctly Indo-Chinese in the character of its animal inhabitants. The last connection of the island with the mainland was very likely through the Luichow Peninsula, unless the northern part of the Gulf of Tonkin was submerged during the process of separation. Unfortunately the faunas of the Luichow Peninsula and of western Kwangtung Province are as yet little known, so it cannot be definitely stated whether the fauna of Hainan is more closely related to that of northern Indo-China or to that of the southern extremity of the Chinese mainland. Most likely the relationship of the three areas will show no very striking differences, and the fauna of Hainan will not prove to possess as high a percentage of endemism as is indicated by the large proportion of forms described as new species or new subspecies in this work. In a recent study on the mainland Kwangtung fauna⁽³⁵⁾ in this family of beetles, only 25 of the 143 species considered were known to me to be found on Hainan, but in the present work 38 of the 167 species are recorded also from mainland Kwangtung. This apparently great difference between the two areas can be explained to some degree by the fact that the collections at hand probably represent only a small fraction of the actual fauna in both cases, and also by the fact that the Kwangtung material studied largely came from the northern and northeastern extremities of the province, and most of the Hainan material from the south central part of the island.

The relationship of the Hainan fauna with that of Burma and Siam seems to be very close, and doubtless many of the species here recorded from Hainan and one or both of the other two mentioned regions will later be found also in Indo-China or in the southwestern corner of China.

The geographical affinities of the Hainan longicorns, as far as the distribution of the various species is known, shows the following order of relationship with other regions, according to

the number of species held in common with Hainan: South China mainland, 47 species; Formosa, 36; Indo-China, 34; Burma 28; Siam, 24; Hongkong, 21; India, 20; Malay Peninsula, 14; Assam, 14; Sunda Islands, 13; Ryu Kyu (Loochoo) Islands, 7; Japan proper, 7; Central China, 5; Andaman Islands, 5; Ceylon, 4; Wallacea, 4; North China, 3; Philippine Islands, 2; Korea, 2; and West China, Tibet, Africa, and the Bonin Islands with 1 species each in common with Hainan. One of the striking facts is the paucity of species (two) held in common with the Philippines, whereas the latitude is practically the same and the distance separating the two regions not very great. This circumstance can be contrasted with the 36 species possessed by Hainan in common with Formosa, which is just to the north of the Philippines and farther, in actual distance, from Hainan.

The affinity of the Hainan fauna with the Palæarctic region seems to be rather remote. No species are known to be found in common with Europe or Siberia, and only 3 Hainan species extend as far northward as North China.

According to the present picture, 72, or 43.1 per cent, of the 167 known Hainan species in this family, appear to be endemic, but it is predicted that further study will considerably lower this percentage.

EXPLANATION OF SPECIAL TERMS

CICATRIX OPEN. A cicatrix, or raised and more or less roughened area on the dorsal side of the distal end of the antennal scape, which is not entirely surrounded by an elevated rim.

CICATRIX CLOSED. A cicatrix entirely surrounded by a raised rim.

COXAL CAVITIES CLOSED, or OPEN. Acetabulæ which, in the anterior pair, are, or are not, completely enclosed posteriorly by the sternum, and in the middle pair are, or are not, shut off externally from the mesepimera by contact of the mesepisterna with the metasternum.

DIVARICATE. Tarsal claws in which the two members of each pair are directed in more or less opposite directions, in other words, form an angle of about 180° with each other.

DIVERGENT. Tarsal claws with each member directed at an angle of 50° to 100°, or thereabouts, in relation to each other.

EYES DIVIDED. Each of the two compound eyes consisting of two lobes which are completely separated, or connected by a fine line.

EYES EMARGINATE. Each compound eye indented on one side, generally near the antennal insertion.

GENAL ANGLE. The angle formed by the genal margin and the inferior margin of the front of the head, as seen in an anterior view.

GENAL MARGINS. The lower parts of the sides of the head, as seen in an anterior view.

INTERCOXAL PROCESS. Prolongation of a sternum posteriorly or anteriorly between coxal cavities. This refers to the anterior and middle coxæ, as far as thoracic sterna are concerned, either the mesosternum or metasternum, or both, with a process between the middle coxæ.

MIDDLE TIBIÆ GROOVED. Implies the presence of an oblique groove on the outer edge of each tibia a short distance before the apex, often more or less hidden by hairs.

RETRACTILE HEAD. A head that in the normal contracted condition touches, or nearly touches, the anterior coxæ.

SCAPE. The first segment of an antenna.

ENUMERATION OF SPECIES

The aggregate of the species in the collections at hand, together with the additional forms recorded by Gahan, totals 167, distributed in 94 genera, representing 39 tribes of 5 subfamilies. Seventy of the forms are herein described as new species or geographical subspecies, and 23 genera and 106 species are new to China. Five new genera, 1 new subgenus, and 3 new tribal names are also proposed. The names are enumerated in the following list.

PRIONINÆ

PRIONINI

- | | |
|---------------------------------------|---|
| 1. <i>Baladeva walkeri</i> Waterh. | 3. <i>Priotyrranus</i> (<i>Chollides</i>) <i>closteroides</i> (Thoms.). |
| 2. <i>Paraphrus granulosus</i> Thoms. | |

MACROTOMINI

4. *Macrotoma* (*Zoobla*) *hainana*
sp. nov.

MEGOPIDINI

- | | |
|---|---|
| 5. <i>Megopis</i> (<i>Ægosoma</i>) <i>sinicum</i> | 6. <i>Megopis</i> (<i>Ægolipton</i>) <i>marginalis</i> (Fabr.) comb. nov. |
| <i>hainanensis</i> (Gahan). | |

PHILINI

- | | |
|--|---|
| 7. <i>Philus antennatus</i> (Gyllenh.) | 8. <i>Philus pallescens tristis</i> subsp. nov. |
|--|---|

DISTENINÆ

DISTENIINI

9. *Noemia submetallica* sp. nov.

LEPTURIINÆ

LEPTURINI

- | | |
|--|---|
| 10. <i>Ephies gahani</i> sp. nov. | 12. <i>Strangalia longicorne obscura</i>
subsp. nov. |
| 11. <i>Strangalia lateripicta loimailia</i>
subsp. nov. | |

CERAMBYCINÆ

ACHRYSONINI

13. *Nortia geniculata* sp. nov.

CERAMBYCINI

- | | |
|---|--|
| 14. <i>Plocæderus obesus</i> Gahan. | 18. <i>Dialeges undulatus</i> Gahan. |
| 15. <i>Nadezhdiella cantori</i> (Hope). | 19. <i>Trachylophus sinensis</i> Gahan. |
| 16. <i>Æolesthes holosericea</i> (Fabr.). | 20. <i>Rhytidodera boweringii</i> White. |
| 17. <i>Trirachys orientalis</i> Hope. | |

HESPEROPHANINI

- | | |
|---------------------------------------|---|
| 21. <i>Gnatholia eburifera</i> Thoms. | 22. <i>Stromatium longicorne</i> (New m.) |
|---------------------------------------|---|

CALLIDIOPSINI

- | | |
|--|------------------------------------|
| 23. <i>Ceresium geniculatum</i> White. | 24. <i>Ceresium sinicum</i> White. |
|--|------------------------------------|

MOLORCHINI

- | | |
|---|--|
| 25. <i>Merionæda</i> (<i>Ocytasia</i>) <i>formosana burkwalli</i> subsp. nov. | 26. <i>Kunbir pallidipennis</i> sp. nov. |
|---|--|

CALLICHROMINI

- | | |
|---|---|
| 27. <i>Embrik-Strandia unifasciata</i> (Rits.) comb. nov. | 30. <i>Leontium nigroscutellatum</i> sp. nov. |
| 28. <i>Polyzonus prasinus</i> (White). | 31. <i>Chelidonium argentatum</i> (Dalm.). |
| 29. <i>Chloridolum loochooanum hainanicum</i> subsp. nov. | 32. <i>Chelidonium gibbicolle</i> (White). |

COMPSOCERINI

33. *Rosalia* (*Eurybatus*) *decempunctata* (Westw.).

CLYTINI

- | | |
|---|---|
| 34. <i>Xylotrechus basalis</i> Schw. | 42. <i>Chlorophorus macaumensis</i> (Chevr.). |
| 35. <i>Xylotrechus magnicollis</i> Fairm. | 43. <i>Chlorophorus reductus</i> Pic. |
| 36. <i>Xylotrechus nigrosulphureus</i> sp. nov. | 44. <i>Chlorophorus separatus</i> sp. nov. |
| 37. <i>Xylotrechus quadripes</i> Chevr. | 45. <i>Rhaphuma pieli</i> sp. nov. |
| 38. <i>Perissus indistinctus</i> sp. nov. | 46. <i>Demonax bimaculicollis</i> (Schw.) comb. nov. |
| 39. <i>Perissus kankauensis chungkonensis</i> supsp. nov. | 47. <i>Demonax brevespinosus</i> sp. nov. |
| 40. <i>Chlorophorus annularis</i> (Fabr.) | 48. <i>Demonax matsushitai reticulicollis</i> subsp. nov. |
| 41. <i>Chlorophorus hainanicus</i> sp. nov. | 49. <i>Sclerhrus stenocylindricus</i> Fairm. |

TILLOMORPHINI

50. *Epipedocera hoffmanni* sp. nov.

CLEOMENINI

51. *Dere macilenta* sp. nov.

STENASPINI

52. *Purpuricenus malaccensis* (Lacord.).

LAMIINÆ

MONOCHAMINI

- | | |
|---|---|
| 53. <i>Psacotha inarmata</i> sp. nov. | 61. <i>Melanauster macrospilus</i> Gahan. |
| 54. <i>Epepeotes tonkinensis</i> (Auriv.)
comb. nov. | 62. <i>Melanauster pirouletii similis</i>
Gahan comb. nov. |
| 55. <i>Pelargoderus apicalis</i> Gahan. | 63. <i>Aristobia hispida</i> (Saund.). |
| 56. <i>Monochamus bimaculatus</i> Gahan. | 64. <i>Aristobia testudo</i> (Voet). |
| 57. <i>Monochamus versteegi</i> Rits. | 65. <i>Blepephæus subcruciatu</i> s
(White). |
| 58. <i>Dihamus sericeomicans</i>
(Fairm.) | 66. <i>Blepephæus succinctor</i> (Chevr.). |
| 59. <i>Dihammus speciosus</i> (Gahan). | 67. <i>Blepephæus variegatus</i> sp. nov. |
| 60. <i>Melanauster chinensis</i> (Först.) | 68. <i>Hainanhammus griseopubens</i>
gen. et sp. nov. |

AGNIINI

69. *Pharsalia ferruginea* Gahan.

BATOCERINI

- | | |
|---|---------------------------------------|
| 70. <i>Batocera roylei orientalis</i> Kr. | 73. <i>Apriona germari</i> (Hope). |
| 71. <i>Batocera rubus</i> (Linn.). | |
| 72. <i>Batocera rufomaculata</i> (De Geer). | 74. <i>Apriona swainsoni</i> (Hope.). |

MESOSINI

- | | |
|---|---|
| 75. <i>Mesosa maculifemorata</i> sp. nov. | 80. <i>Coptops leucostictica rustica</i>
subsp. nov. |
| 76. <i>Mesocacia assamensis</i> Heller. | 81. <i>Coptops lichenea</i> Pasc. |
| 77. <i>Mesocacia punctifasciata</i> sp.
nov. | 82. <i>Chæromorpha formosana pal-</i>
<i>minsulana</i> subsp. nov. |
| 78. ? <i>Mesocacia rugicollis</i> sp. nov. | 83. <i>Falsomesosella hakka</i> Gressitt. |
| 79. <i>Cacia nigrofasciata</i> sp. nov. | |

ANCYLONOTINI

- | | |
|--|---|
| 84. <i>Palimna annulata tessellata</i>
(Pasc.). | 85. <i>Palimna palimnoides similis</i>
subsp. nov. |
|--|---|

XYLORHIZINI

86. *Xylorhiza adusta* (Wied.).

DORCASCHEMATINI

87. *Olenocamptus bilobus* (Fabr.).

XENOLEINI

88. *Xenolea tomentosa asiatica*
Pic).

NYCTIMENINI

89. *Euseboides matsudai spinipennis* subsp. nov.

HECYRINI

90. *Mæchotypa suffusa* (Pasc.).

NIPHONINI

- | | |
|---|---|
| 91. <i>Niphona cantonensis</i> Gressitt. | 100. <i>Pterolophia cervina</i> Gressitt. |
| 92. <i>Niphona excisa</i> Pasc. | 101. <i>Pterolophia kaleea</i> (Bates). |
| 93. <i>Niphona hookeri</i> Gahan. | 102. <i>Lychrosis fasciatus</i> sp. nov. |
| 94. <i>Niphona minor</i> (Lameere). | 103. <i>Lychrosis zebrinus</i> (Pasc.). |
| 95. <i>Niphona yanoi reducta</i> subsp. nov. | 104. <i>Desisa subfasciata</i> (Pasc.). |
| 96. <i>Pterolophia albonigra</i> sp. nov. | 105. <i>Enispia anfracta</i> sp. nov. |
| 97. <i>Pterolophia annulata</i> (Chevr.). | 106. <i>Enispia quadristigma</i> sp. nov. |
| 98. <i>Pterolophia arctofasciata</i> sp. nov. | 107. <i>Enispia tholana</i> sp. nov. |
| 99. <i>Pterolophia camela</i> Pic. | 108. <i>Phesates marmoratus</i> sp. nov. |

APOMECYNINI

- | | |
|--|---|
| 109. <i>Apomecyna quadrifasciata</i> Thoms. | 113. <i>Ropica formosana dorsalis</i> Schw. |
| 110. <i>Apomecyna cantator excavaticeps</i> Pic comb. nov. | 114. <i>Iproca acuminata</i> gen. et sp. nov. |
| 111. <i>Ropica sublineata</i> sp. nov. | 115. <i>Eunidia lateralis</i> Gahan. |
| 112. <i>Ropica ngauchiliæ</i> sp. nov. | |

PTERICOPTINI

- | | |
|---------------------------------------|---|
| 116. <i>Sybra breuningi</i> sp. nov. | 119. <i>Sybra punctatostrata</i> Bates. |
| 117. <i>Sybra pascoei</i> Lameere. | 120. <i>Atimura apicalis</i> Gahan. |
| 118. <i>Sybra posticalis</i> (Pasc.). | 121. <i>Atimura cylindrica</i> sp. nov. |

APODASYINI

- | | |
|---|---|
| 122. <i>Terinæa rufonigra</i> sp. nov. | 124. <i>Pseudanæsthetis whiteheadi</i> sp. nov. |
| 123. <i>Pseudanæsthetis seticornis</i> sp. nov. | |

ESTOLINI

- | | |
|--|---|
| 125. <i>Zotale lineata</i> (Gahan). | 127. <i>Microstola bidentata</i> gen. et sp. nov. |
| 126. <i>Donyisia costata</i> (Matsush.) gen. et comb. nov. | |

ACANTHOCININI

- | | |
|---|--|
| 128. <i>Neacanista tuberculipenne</i> gen. et sp. nov. | 132. <i>Exocentrus trifasciellus</i> sp. nov. |
| 129. <i>Exocentrus alboguttatus subconjunctus</i> subsp. nov. | 133. <i>Miænia laterimaculata</i> sp. nov. |
| 130. <i>Exocentrus basirufus</i> sp. nov. | 134. <i>Rondibilis seatonii</i> sp. nov. |
| 131. <i>Exocentrus constricticollis</i> sp. nov. | 135. <i>Ostedes inermis dwabinus</i> subsp. nov. |

Mentum transverse; maxillary palpi 4-segmented; labial palpi 3-segmented; antennæ generally longer than body, normally 11-, rarely 12-segmented; prothorax more or less cylindrical; elytra entire or abbreviated, generally wider than prothorax; metepisternum more or less parallel; metepimeron generally hidden by elytra; legs long; tarsi with third segment more or less deeply bilobed, fourth segment very minute, fifth segment bearing a pair of divergent or divaricate claws.

This family has been considered by many authors to represent a suborder, or superfamily (Longicornia), of the order Coleoptera (beetles), generally divided into families, which correspond, in part, to the subfamilies as used in this work. These subfamily groupings, as herein used, are patterned largely after the classifications used by Ganglbauer, Aurivillius, and Craighead. The writer has, however, particularly followed Gahan's work (1906) for all but the Lamiinæ, except that the latter worker used the superfamily Longicornia, dividing it into the two families Cerambycidae and Lamiidae, the former including the five subfamilies other than the Lamiinæ of the present scheme. One of these subfamilies, the Spondylinae, is not as yet known to occur on Hainan Island. It is differentiated from the others by the following combination of characters: antennæ moniliform, thick, not reaching beyond prothorax; anterior tibiae toothed externally and strongly toothed and spined apically; fourth tarsal segment enlarged. Leconte and Pascoe divided their suborder Longicornia into the three families Prionidae, Cerambycidae, and Lamiidae, the Cerambycidae including the subfamilies Spondylinae, Disteniinae, Lepturinae, and Cerambycinae of this work. Others have reduced the above suborder to a family, and the three families to subfamilies. The tribe Parandriini (genus *Parandra*) of the subfamily Prioninae (not known from Hainan) has frequently been considered a distinct subfamily or family.

Key to the Hainan subfamilies of Cerambycidae.

1. Anterior and middle tibiae simple, lacking oblique grooves or concave subapical portions bearing short, erect hairs..... 2.
Anterior tibiae generally obliquely grooved internally; middle tibiae usually obliquely grooved before apex of outer side or with a slightly concave profile or some short, stiff, erect hairs hiding surface.....4.
2. Prothorax not margined laterally; anterior coxae rarely strongly transverse; inner lobes of maxillae developed..... 3.
Prothorax margined laterally; anterior coxae strongly transverse; inner lobes of maxillae obsolete..... PRIONINÆ.

3. Head strongly constricted behind eyes; clypeus very large; anterior coxæ conical, angulate externally..... LEPTURINÆ.
 Head not strongly constricted behind eyes; clypeus not particularly large; anterior coxæ generally depressed, rarely strongly angulate externally CERAMBYCINÆ.
4. Head inclined and abbreviated anteriorly; antennæ inserted close to mandibles; form very slender; antennæ generally with a fringe of long, fine hairs internally; last palpal segment blunt apically.... DISTENINÆ.
 Head vertical in front; antennæ inserted distantly from mandibles; form generally robust; antennæ lacking a fringe of very long, fine hairs for entire length, internally; last palpal segment acute..... LAMINÆ.

PRIONINÆ

PRIONIDES Lacordaire, Gen. Col. 8 (1869) 16.

PRIONIDÆ Bates, Biol. Center. American Col. 5 (1869) 1; Pascoe, Trans. Ent. Soc. London (3) 3 (1869) 660.

PRIONINI Ganglbauer, (Bestimm.-Tabell. Europ. Col. 7), Verh. zool.-bot. Gesell. Wien 31 (1882) 684.

PRIONINÆ Gahan, Fauna Brit. India Col. 1 (1906) 2; Lameere, Gen. Ins. 172 (1919) 4.

PRIONIENS Planet, Encyclop. Ent. 2 (1924) 17.

Prothorax margined laterally, frequently toothed or spined along margin; anterior coxæ strongly transverse, their cavities widely open posteriorly; inner lobe of maxillæ lacking or vestigial; ligula corneous; antennæ inserted more or less close to bases of mandibles; mesonotum lacking stridulatory area, except in *Philus*; sound generally produced by rubbing of hind femora on margins of elytra.

Worldwide in distribution. This subfamily includes some of the largest living insects. The larvæ generally live in dead or rotten wood or in the ground beneath roots or rotting logs.

Key to the Hainan tribes of Prioninæ.

1. Prothorax broadly or finely toothed along lateral margins; metathoracic episterna parallel-sided, truncate apically..... 2.
 Prothorax not toothed along lateral margin; metathoracic episterna gradually narrowed posteriorly 3.
2. Prothorax broad and shallowly arched above; lateral margins high, consisting of broad, flat teeth, middle tooth largest; antennæ serrate.

PRIONINI.

Prothorax subrectangular, subvertical at sides, margin low, bearing a row of many small teeth; antennal segments flattened-cylindrical, third much longer than following..... MACROTOMINI.

3. Prothorax transverse; third tarsal segment cleft nearly to base; third antennal segment as long as, or nearly as long as, following two segments combined, generally asperate; vein Cu₁ of hind wing simple.

MEGOPIDINI.

Prothorax longer than broad; third tarsal segment cleft for one-half its length; third antennal segment barely longer than fourth, not asperate; vein Cu_1 branched, joined by a crossvein to Cu_2PHILINI.²

PRIONINI

PRIONIDES VRAIS Lacordaire, Gen. Col. 8 (1869) 35, part.

PRIONINI Gahan, Fauna Brit. India Col. 1 (1906) 4; Lameere, Mem. Soc. Ent. Belg. 21 (1912) 182; Gen. Ins. 172 (1919) 104.

Prothorax widely margined laterally, margins generally forming three broad flat teeth on each side; prosternal intercoxal process swollen, arched or subvertical posteriorly; labrum distinct; scape longer than broad; third and following antennal segments generally serrate.

Key to the Hainan genera of Prionini.

1. Mandibles long, curving backward; eyes not very closely approximated above 2.
Mandibles not very long, extending forward; eyes closely approximated above in both sexes *Prionyrranus* (*Chollides*).
2. Mandibles of male extremely long; lobes of third tarsal segment acute apically *Baladeva*.
Mandibles of male not extremely long; lobes of third tarsal segment rounded apically *Paraphrus*.

Genus BALADEVA Waterhouse

Baladeva WATERHOUSE, Trans. Ent. Soc. London 2 (1840) 225; GAHAN, Fauna Brit. India Col. 1 (1906) 8; LAMEERE, Gen. Ins. 172 (1919) 130.

Cyrtognathus LACORDAIRE, Gen. Col. 8 (1869) 52, part.

Neck broad, moderately long; mandibles very long, curved backwards below in male; prosternal process greatly swollen, rounded behind, partially overlapping mesosternal process; prothorax with three spines at each side, second spine largest, third smallest; antennæ slightly longer than body in male, two-thirds as long in female, subimbricate; shoulders somewhat obliquely produced; metasternum parallel, truncate apically.

² The tribe Philini has been placed in the subfamily Cerambycinae, just preceding the tribe Lepturini, by Aurivillius^(1, p. 156) and in the subfamily Lepturinae by Boppe,^(8, p. 52) who has been followed by Matsushita^(50, p. 169) and by Liu.^(48, p. 475) However, I prefer, for the present, to follow Lacordaire and Gahan in placing it with the subfamily Prioninae because it possesses some of the principal characters of this group. Obviously, it forms a link between the Prioninae and the Lepturinae, and cannot be properly placed in either. The determination of its correct position should doubtless be aided by knowledge of the larval characters.

This genus and the following one have been considered as subgenera of *Dorysthenes* (= *Cyrtognathus*, part).

Genotype.—*Baladeva walkeri* Waterhouse.

Range.—Burma; Siam; Hainan Island.

BALADEVA WALKERI Waterhouse. Plate 1, fig. 1.

Baladeva walkeri WATERHOUSE, Trans. Ent. Soc. London 2 (1840)
226, pl. 21, fig. 1; GAHAN, Fauna Brit. India Col. 1 (1906) 9.

Male.—Very large. Shiny black; clypeus, tarsal claws, and apical antennal segments somewhat reddish; eyes with bronzy reflections. Anterior and posterior borders of prothorax, sides of metathorax, and apex of last abdominal segment clothed with dull reddish-brown hairs.

Head long and broad, widest at middle of neck; mandibles as long as, or longer than, remainder of head, curved downward and posteriorly, serrate on basal half of outer side, with an external tooth just before middle; genæ acutely prominent; eyes widest in middle; vertex grooved between antennal supports and eyes; occiput fairly smooth. Antennæ two-thirds as long as body, weakly asperate internally; first six segments shiny, following segments dull basally; fifth and following segments biangulate externally at apices; third segment barely longer than scape, as long as fourth and fifth segments combined. Prothorax transverse, narrower than elytra, 3-spined at each side, middle spine largest, third very weak. Elytra subacutely prominent at humeral angles, narrowed and rounded apically; surface subvermiculose and sparsely granulate basally, three or four raised, longitudinal lines discernible; first hind tarsal segment as long as following two united.

Female.—Head shorter; mandibles shorter than rest of head, toothed externally beyond middle; antennæ three-fifths as long as body, not asperate internally; elytra broader, shorter and less narrowed apically than in male.

Length, 42 to 67 millimeters; breadth, 18 to 25.

Specimens in Lingnan Natural History Museum from near Nodoo, 1929, Lingnan Univ. Fifth Hainan Exped.; "Hainan," Hoihow, northern Hainan, Lok-kei, June 18, Hau-ying-ts'uen, August 8, Nodoo to Nam-fung, June 23, 1932, and Tai-pin-ts'uen (Dwa-Bi), central Hainan, altitude 350 meters, July 24, 1935; one male, in Musée Heude, Shanghai, from Hoidow, 2 males from Kachek, eastern Hainan, altitude 25 meters, August 8, 1935, taken by the author; 2 males and 1 female, Nodoo, west-central Hainan, altitude 250 meters, June 28 and July 13, 1935,

1 male, Dwa-Bi (Tai-pin-ts'uen), July 28, 1935, 1 female, Tachian, central Hainan, altitude 600 meters, June 15, 1935, taken by the author; 1 female, Hau-ying, Lin-fa Shan, northcentral Hainan, August 11, 1932, in the author's collection, F. K. To; 1 male, Nodoo, July 1935, in van Dyke collection, California Academy of Sciences, and 1 male, same data, in the United States National Museum, taken by the author.

New to Hainan.

Distribution.—Burma; Siam; Hainan Island.

Genus PARAPHRUS Thomson

Paraphrus THOMSON, *Classif. Ceramb.* (1861) 330; GAHAN, *Fauna Brit. India Col.* 1 (1906) 13; LAMEERE, *Gen. Ins.* 172 (1919) 128.

Cyrtognathus LACORDAIRE, *Gen. Col.* 8 (1869) 51, part.

Head large; mandibles moderately long, slightly curved posteriorly; antennal supports broad, separated by a deep, narrow groove; frons with a subapical obtuse groove joined to interantennary groove at apex; antennæ 11-segmented, apical segment resembling two segments; third segment subequal in length to following two segments in male; prothorax 3-toothed at sides, first two teeth subequal; prosternal process swollen and produced posteriorly; lobes of third tarsal segment rounded apically.

Genotype.—*Cyrtognathus granulosus* Thomson.

Range.—North India to Hainan and Borneo.

PARAPHUS GRANULOSUS Thomson.

Cyrtognathus granulosus THOMSON, *Classif. Ceramb.* (1861) 329, India.

Paraphrus granulosus THOMSON, *Syst. Ceramb.* (1864, 281; GAHAN, *Fauna Brit. India Col.* 1 (1906) 14; LAMEERE, *Ann. Soc. Ent. Belg.* 55 (1911) 335; LIU, *Lingnan Sci. Journ.* 12 (1933) 401.

Male.—Bright reddish brown, varying to testaceous brown or blackish brown; head and basal antennal segments blackish to reddish brown; palpi reddish. Body glabrous and slightly glossy above; hind thorax moderately clothed with soft, light brown hairs.

Head somewhat prominent, weakly convex between antennal insertions; vertex grooved, depressed, slightly raised at each side between eyes; surface finely punctured anteriorly; occiput punctured in middle, granulose at sides. Antennæ a little longer than body; first three segments smooth and shiny above, sparsely punctured, asperate below; fifth and following segments reticulately pitted longitudinally; third segment slightly longer than following two segments together. Prothorax transverse, sub-

equally broad at first and second lateral spines; surface even, very finely and shallowly punctulate. Scutellum sparsely punctured, rounded behind. Elytra slightly narrowed posteriorly, rounded behind, each with two distinct longitudinal raised lines, joining at apical sixth; surface finely and irregularly wrinkled, finely punctured and minutely punctulate between punctures. Forelegs densely punctate, asperate internally; hind femora smooth, finely punctate; first hind tarsal segment longer than following two segments together.

Length, 28 to 50 millimeters; breadth, 10 to 17.5.

Specimens in Lingnan Natural History Museum: several from Hoihow, April, F. K. To; May 14, 1932, O. K. Lau; 1 from Ngai-chau, southern Hainan, May 27 to 30, 1932, W. E. Hoffmann and O. K. Lau; several from Tai-pin-ts'uen (Dwa-Bi), near Loi Mother Mountain, April and May, 1935 (1 in author's collection), F. K. To; 1 from Kacheck, May 3 to 6, 1932, 1 from Nodoo, April, 1932. In author's collection: 1 from Nodoo, June 2, 1935, taken by the author; a large series from Fan-ziang, southcentral Hainan, March 5, 1936, taken for the author by a native collector; duplicates in the California Academy of Sciences.

Distribution.—North India; Burma; Siam; Tonkin; Hainan Island.

Genus PRIOTYRRANUS Thomson

Priotyprranus THOMSON, Archiv. Ent. 1 (1857) 120; GAHAN, Fauna Brit. India Col. 1 (1906) 21; LAMEERE, Gen. Ins. 172 (1919) 112.
Prionotyrranus GEMMINGER et HAROLD, Cat. Col. 9 (1873) 2759.

Clypeus separated from frons by an arcuate depression; antennæ as long as, or a little longer than, body in male, shorter than body in female, postbasal segments acute apically; prothorax transverse, 3-spined at each side, spines slightly curved, middle spine longest, other two spines subequal, anterior and posterior margins convex in middle, concave on either side; elytra broad, rounded apically; prosternal intercoxal process strongly arched; first hind tarsal segment as long as following two segments united.

Genotype.—*Prionus mordax* White.

Range.—South India; South China; Hainan Island; Formosa; Borneo.

Subgenus CHOLLIDES Thomson

Chollides THOMSON, Rev. Mag. Zool. (1877) 264; LAMEERE, Gen. Ins. 172 (1919) 113.

Cnethocerus BATES, Ent. Monthly Mag. 14 (1878) 273.

Prionacus FAIRMAIRE, Notes Leyd. Mus. 18 (1897) 127.

Mandibles projecting forward, strongly curved preapically; eyes large, upper lobes wide and very closely approximate in both sexes; antennæ of male as long as body, third and following segment flattened, acute internally and externally at apices, longitudinally multi-carinate; antennæ of female slender, weakly flattened and apically spined, sparsely punctured on first six segments, longitudinally carinate on remaining segments; scutellum scutiform, as long as broad.

Type.—*Chollides closteroides* Thomson.

Range.—China; Tonkin; Hainan Island; Formosa.

PRIOTYRRANUS (CHOLLIDES) CLOSTEROIDES (Thomson).

Chollides closteroides THOMSON, Rev. Mag. Zool. (1877) 264.

Cnethocerus messi BATES, Ent. Monthly Mag. 14 (1878) 273, Hong-kong.

Prionacus strigicornis FAIRMAIRE, Notes Leyd. Mus. 18 (1897) 127, South China.

Priotyrranus (Chollides) closteroides LAMEERE, Gen. Ins. 172 (1919)

114; MATSUSHITA, Journ. Fac. Agr. Hokk. Imp. Univ. 34 (1933)

165; GRESSITT, Lingnan Sci. Journ. 18 (1939) 5.

Female.—Reddish brown, legs and abdomen reddish testaceous; head and prothorax dark reddish brown; eyes nearly black. Dorsal surface largely glabrous, except for labrum, mandibles, anterior and posterior borders of prothorax, and a few short, scattered hairs on elytra; ventral surface of thorax well clothed with golden-brown hairs; abdomen nearly glabrous.

Head short and broad; mandibles projecting forward; maxillary palpi long; eyes large; frons and occiput coarsely punctured. Antennæ four-fifths as long as body, fairly slender, shiny basally; third segment barely longer than fourth. Prothorax coarsely rugulose-punctate, somewhat shiny, middle of disc with a small smooth area. Scutellum finely vermiculate-punctate, dull. Elytra coarsely rugulose-punctate basally, more finely so beyond, moderately shiny. Hind breast finely vermiculate-punctate; abdomen with shallow impressions, minutely punctulate along middle. Tibiæ strongly margined behind; first hind tarsal segment fully as long as following two united.

Length, 37 millimeters; breadth, 13.75.

A single female, in the author's collection, taken at Cheung-kon-ts'uen (Chung-kong), central Hainan, altitude 280 meters, April 4 to 7, 1935, by F. K. To.

Distribution.—South China; Tonkin; Hainan Island; Formosa.

MACROTOMINI

MACROTOMIDES Lacordaire, Gen. Coleopt. 8 (1869) 96.

REMPHANIDES Lacordaire, tom. cit. 103.

MACROTOMINI Gahan, Fauna Brit. India Col. 1 (1906) 29; Lameere, Mem. Soc. Ent. Belg. 21 (1922) 180.

Eyes entire or nearly entire; third antennal segment generally large; prothorax rectangular or trapeziform, more or less angulate posteriorly at either side; generally finely toothed along lateral margins; prosternal intercoxal process broad and flat; legs spiny.

Genus MACROTOMA Serville

Macrotoma SERVILLE, Ann. Soc. ent. France (1832) 137; LACORDAIRE, Gen. Col. 8 (1869) 97; GAHAN, Fauna Brit. India Col. 1 (1906) 35; LAMEERE, Gen. Ins. 172 (1919) 146.

Head narrowly concave between antennal insertions; eyes large, entire; neck broad; antennæ about as long as body in male, shorter in female; scape short and broad; third segment thick, longer than following two united, asperate; prothorax short, narrowed apically, sharply declivitous laterally, with a row of short, fine teeth along lateral margins; elytra more than twice as long as broad; forelegs very rough and spinous in male, others toothed at least on lower edges of femora.

Genotype.—*Prionus serripes* Fabricius.

Range.—Oriental and Ethiopian Regions; Mediterranean Sub-region.

Subgenus ZOBLAX Thomson

Prinobius MULSANT, Ann. Soc. d'Agric. Lyon 5 (1842) 204; LANSB., Notes Leyd. Mus. 6 (1884) 144; GAHAN, Fauna Brit. India. Col. 1 (1906) 36.

Zoblax THOMSON, Rev. Mag. Zool. (1877) 274; GAHAN, Fauna Brit. India Col. 1 (1906) 38; LAMEERE, Gen. Ins. 172 (1919) 50.

Prothoracic disc of male with large, swollen, sparsely and finely punctured callosities, not entirely heavily punctured as in the typical subgenus.

Type.—*Zoblax elateroides* Thomson.

Range.—Oriental region; Philippines.

MACROTOMA (ZOBLAX) HAINANA Gressitt sp. nov. Plate 1, fig. 2.

Male.—A moderately small *Macrotoma*, broadest posteriorly. Dark reddish brown; head, basal antennal segments, and forelegs nearly black; antennæ and pronotal callosities shiny, sub-metallic; tarsi and posterior margins of abdominal segments lighter reddish brown.

Head a little longer than broad, moderately declivitous; antennal insertions moderately swollen, irregularly punctured, closely approximated for a very short space behind which is a sparsely punctured concavity; frons with a deep, but not very broad, obtuse depression at its base; occiput very sparsely punctured in middle, finely and densely granulose-punctate behind eyes. Antennæ nine-tenths as long as body, slender; scape depressed, twice as long as broad, sparsely punctured, slightly longer than fourth to tenth segments, respectively; third segment slender, slightly flattened, twice as long as scape. Prothorax nearly one and one-half times as broad as long, broader at base than at apex, weakly rounded and finely tuberculate-margined at sides; disc swollen at each side, finely and closely punctured except for a large subtriangular area on each side before middle, a narrow, slightly curved, raised strip along upper part of each side and basal portion, between posterior extensions of former strips, together with a narrow, median, anterior extension to middle; these strips raised, shiny, finely and sparsely punctured. Scutellum dull, sparsely punctured, longitudinally grooved, rounded-truncate behind. Elytra gradually broadened to last quarter, broadly rounded behind; surface of each elytron shiny, densely vermiculate, with four distinct, longitudinal, raised lines which branch and curve before apex. Metasternum with a large, triangular area smooth and shiny, remainder densely and finely punctured; abdomen glossy and sparsely punctured along middle, rougher at sides. Anterior femora and tibiæ densely asperate, middle and hind pairs less so, posterior femora largely smooth and glossy, anterior tibiæ spined below; first hind tarsal segment subequal to following two.

Length, 32 to 45 millimeters; breadth, 10.5 to 15.

Holotype, male, No. 53464 United States National Museum, Dwa-Bi (Tai-pin), near Loi Mother Mountain, central Hainan Island, altitude 370 meters, July 23, 1935, collected by the author; paratopotype, male, Lingnan Natural History Museum, and paratopotype, male, author's collection, vicinity of villages at foot of Lai-mo-ling (Loi Mother Mountain), May 25 to 28, F. K. To.

Differs from *M. crenata* (Fabricius) in being darker, more shiny, with the ventral surface of the thorax less hairy, the elytra more distinctly costate, the third antennal segment smoother and flatter, the prothorax more briefly spined along margins, and the disc with the raised areas wider. Differs (*ex descr.*) from *M. bouvieri* Lameere, described from a female from Tonkin, in

being largely reddish brown instead of black with bronzy-green reflections, in having the middle and hind femora and tibiæ spinous only on lower margins instead of on both sides, the prosternum not shiny at sides, the pronotum minutely punctate, not granulose at sides.

Distribution.—Hainan Island.

Tribe MEZOPIDINI Gressitt nomen novum

ÆGOSOMIDES Lacordaire, Gen. Coleopt. 8 (1869) 153.

ÆGOSOMATINÆ Pascoe, Trans. Ent. Soc. London (3) 3 (1869) 678.

CALLIPOGONINI subtribe MEGOPIDINA Lameere, Ann. Soc. Ent. Belg. 43 (1904) 7.

ÆGOSOMINI Gahan, Fauna Brit. India Col. 1 (1906) 41.

Prothorax generally neither toothed nor spined, and only narrowly or obtusely margined laterally; third antennal segment as long as, or nearly as long as, following two united; metathoracic episterna gradually narrowed to acute apices; third to fifth antennal segments more or less asperate or briefly spined, thickened in males; eyes emarginate; third tarsal segment cleft nearly to base.

Lameere included the group Ægosomides of Lacordaire with the Eurypodini as subtribes under the tribe Callipogonini. I prefer, however, to consider them as different tribes, because the latter differ from the former in having the antennæ much smaller and simple, and the prothorax rectangular and distinctly margined horizontally at sides, the elytra shorter, flatter and smoother, and the metepisternum truncate, instead of subacute, apically.

Genus MEGOPIS Serville

Megopis SERVILLE, Ann. Soc. ent. France 1 (1832) 161; Gen. Ins. 172 (1919) 71; THOMSON, Classif. Ceramb. (1860) 289; Syst. Ceramb. (1864) 472; LACORDAIRE, Gen. Coleopt. 8 (1869) 155; LAMEERE, Ann. Soc. Ent. Belg. 53 (1909) 151.

Ægosoma SERVILLE, Ann. Soc. ent. France 1 (1832) 162; LACORDAIRE, Gen. Col. 8 (1869) 154; GAHAN, Fauna Brit. Ind. Col. 1 (1906) 44.

Pachypleura WHITE, Cat. Col. Brit. Mus. 7 (1863) 27; THOMSON, Classif. Ceramb. (1860) 288; Syst. Ceramb. (1864) 472.

Head fairly long; eyes vertical, emarginate, clypeus distinctly separated from frons; third antennal segment large, generally asperate; prothorax unarmed laterally; lateral margins curved downward anteriorly from posteriolateral angles; elytra long, broader than prothorax.

Genotype.—*Megopis mutica* Serville.

Range.—Southern Europe; Africa; southern Asia.

Key to the Hainan subgenera of Megopis.

1. Antennæ lacking a fringe of hairs internally; prothorax distinctly broadest at base, narrowed anteriorly; fifth antennal segment nearly as long as following two together; middle coxæ separated.... *Ægosoma*.
Antennæ briefly fringed with hairs internally; prothorax somewhat rounded laterally; fifth antennal segment shorter than following two together; middle coxæ contiguous..... *Ægolipton*.

Subgenus ÆGOSOMA Serville

Ægosoma SERVILLE, Ann. Soc. ent. France 1 (1832) 162; LACORDAIRE, Gen. Coleopt. 8 (1869) 154; LAMEERE, Gen. Ins. 172 (1919) 73.

Third to fifth antennal segments enlarged, densely asperate and spinulose in male, fourth or fifth segment different from following; prothorax broadest at base, narrowed anteriorly; generally three moderately distinct longitudinal raised lines on elytra; last hind tarsal segment fully as long as first three united.

This name has been used more than *Megopis* for the genus as a whole because Lacordaire considered it before the latter, ignoring the fact that *Megopis* had priority, and also because the type of *Ægosoma* is a common European species.

Subgenotype.—*Cerambyx scabricorne* Scopoli.

Range.—Southern Europe; northern Africa; Oriental Region.

MEGOPIS (ÆGOSOMA) SINICUM HAINANENSIS (Gahan).

Ægosoma hainanensis GAHAN, Ann. & Mag. Nat. Hist. (7) 5 (1900) 347, Hainan.

Megopis (Ægosoma) sinica hainanensis LAMEERE, Ann. Soc. ent. Belg. 53 (1909) 139, Sumatra, Borneo.

Male.—Elongate, flattened above, narrowed posteriorly. Tawny-brown above, clothed with thin, pale-buff pubescence, irregularly on head and pronotum and densely on elytra, suture slightly reddish apically; ventral surface and legs reddish black, sparsely clothed with fine, pale hairs.

Head weakly grooved from clypeus onto occiput; inferior eye lobe twice as wide as superior; interocular region strongly and sparsely granulate. Antennæ one and one-fifth as long as body, third to fifth segment thick, densely asperate, briefly spined internally, fifth segment as long as sixth and seventh segments combined. Prothorax one and one-half times as broad as long, irregularly granulose, somewhat swollen on each side of middle of disc and at sides. Scutellum rounded posteriorly, sparsely pubescent. Elytra gradually narrowed, rounded externally and angulated and briefly spined internally at apices. Ventral surface closely and finely punctulate.

Female.—Antennæ five-sixths as long as body, third to fifth segments slenderer than in male, moderately asperate; prothorax shorter and less swollen above and at sides; ovipositor longer than head and prothorax combined when extended.

Length, 29 to 44 millimeters; breadth, 8 to 11.5.

Specimens in Lingnan Natural History Museum from Tai-pin-ts'uen (Dwa-Bi), central Hainan, altitude 250 meters, May 1935, Sam-ts'uen-kai-hui, July 1935, Sam-kwong-ts'uen, August 1935, and Nam-liu-tin, Lam-wan-tung, August 1935, F. K. To; 4 males and 4 females, Tai-pin-ts'uen (Dwa-Bi), July 21 and 29, 1935, taken by the author; 1 male, Sam-kwong-ts'uen, Lam-wan-tung, northcentral Hainan, August 13, 1935, in the writer's collection, 1 male, from Dwa-Bi, in the United States National Museum, July 21, 1935, taken by the author; 1 female, same data, in van Dyke collection, California Academy of Sciences.

Distribution.—Hainan; "Sumatra; Borneo."

Subgenus *ÆGOLIPTON* Gressitt novum

Ægosoma WHITE, Cat. Col. Brit. Mus. 7 (1853) 31, part, not of Serville; LACORDAIRE, Gen. Coleopt. 8 (1869) 155, part; GAHAN, Fauna Brit. India Col. 1 (1906) 45, part.

Baraliphton LAMEERE, Ann. Soc. ent. Belg. 53 (1909) 151; Gen. Ins. 172 (1919) 76, part, not of Thomson.

Antennæ of male with a fringe of short hairs internally for entire length; scape thickened apically; third segment as long as fourth and fifth segments together, third to fifth segments not much different from following; fifth segment barely longer than sixth; prothorax short, rounded laterally, narrowed apically, sinuate basally, finely and accurately margined on lower part of sides; elytra weakly costate, narrow; prosternal intercoxal process narrow, not greatly swollen; middle coxæ contiguous; last segment of hind tarsus shorter than first three united.

Type.—*Cerambyx marginalis* Fabricius.

Range.—Oriental Region; Celebes and Moluccas.

This subgenus includes the first group of the subgenus *Baraliphton* as extended by Lameere.⁽⁴²⁾ Besides the type, it includes at least *Megopis* (*Baraliphton*) *sauteri* Lameere³ of Formosa, and *Ægosoma mandibularis* Fairmaire, of southern China and Formosa. It differs from typical *Baraliphton* Thomson (type: *B.*

³ *Megopis* (*Ægolipton*) *sauteri* (Lameere) comb. nov. has the internal antennal fringe of the male somewhat indistinct; in *marginalis* and in the former the antennæ are fully as long as the body in the female and not greatly different from those of the male.

maculosum Thoms., India) in having the neck slenderer, the antennal scape not spined internally at apex, the third segment much shorter than the remaining segments combined, the fourth to tenth segments similar, gradually decreasing in length, the prothorax smaller, rounded and untoothed laterally, as broad at middle as at base, and narrowed apically. It differs from *Ægosoma* and *Megopis* in having the antennæ distinctly fringed internally for their entire length, the third to fifth antennal segments not greatly differentiated, from *Megopis* in having the apical palpal segment compressed, and from *Ægosoma* in having the fifth and sixth antennal segment similar, the sixth and following segments not greatly flattened, broadened apically or shortened, and the last hind tarsal segment shorter than the first three segments together.

MEGOPIS (ÆGOLIPTON) MARGINALIS (Fabricius) comb. nov.

Cerambyx marginalis FABRICIUS, Syst. Ent. 2 (1775) 169, "Cape of Good Hope."

Ægosoma marginale WHITE, Cat. Col. Brit. Mus 7 (1853) 31, China; GAHAN, Ann. & Mag. Nat. Hist. (7) 5 (1900) 347, Hainan; Fauna Brit. India Col. 1 (1906) 45, Burma, Malay Peninsula and Archipelago.

Ægosoma javanica REDTENBACHER, Reise Novara 2 (1868) 202, Java.

Megopis (Baraliphton) marginalis LAMEERE, Ann. Soc. ent. Belg. 53 (1909) 152.

Megopis marginalis GRESSITT, Lingnan Sci. Journ. 18 (1939) 6.

Male.—Reddish brown, clothed above with thin buff pile, except on margins of prothorax, scutellum, and elytra, which are black; antennæ and legs reddish; hind thorax clothed with moderately long, sparse, golden-brown pubescence; abdomen thinly clothed with short pale hairs.

Head finely granulose, with a few large granules between antennæ and eyes; neck slender and cylindrical; inferior eye lobe three times as wide as superior. Antennæ one and one-third as long as body, fringed internally; third segment moderately rough, as long as fourth and fifth segments combined. Prothorax swollen at either side, sinuate basally, one and one-third as broad as long, irregularly granulose. Scutellum longer than broad. Elytra nearly three times as long as broad, narrowed, rounded, and unarmed apically; surface of each with three or four weakly raised lines. Hind thorax and abdomen finely granulose. Legs moderately rough.

Length, 27 to 35 millimeters; breadth, 6.75 to 9.

Specimens in the Lingnan Natural History Museum from Tai-pin-ts'uen (Dwa-Bi), central Hainan, altitude 250 meters, May, 1935, F. K. To; Ngai-chau, southern Hainan, May, 1932, W. E. Hoffmann and O. K. Lau; Lam-ko, May 23 to 25, 1932, and Sam-kwong-ts'uen, August 1935, F. K. To; 1 male, Fan-ziang, central Hainan, March 5, 1935, taken by a native collector for the author; 1 male, in the author's collection, Nam-po-ts'uen, May 27, 1932, taken by F. K. To.

Distribution.—India; peninsula of southeastern Asia; China; Hainan; Formosa; Malay Archipelago as far as Celebes and Amboina.

PHILINI

MONODESMIDES Lacordaire, Gen. Col. 8 (1869) 157, part.

PHILINI Gahan, Fauna Brit. India Col. 1 (1906) 54; Boppe, Gen. Ins. 178 (1921) 25; Liu, Lingnan Sci. Journ. 12 (1933) 475.

Head narrowed and elongated behind eyes; subvertical in front; labrum distinct from clypeus; eyes large and swollen, emarginate, fairly coarsely faceted; antennæ inserted close together, near mandibles, scape much shorter than third segment; prothorax feebly margined at side; anterior coxæ transverse; middle coxal cavities open to epimera externally.

This tribe contains only two genera, both confined to southern Asia, one of which has been found on Hainan.

Genus PHILUS Saunders

Philus SAUNDERS, Trans. Ent. Soc. London (2) 2 (1853) 110; GAHAN, Fauna Brit. India Col. 1 (1906) 57; BOPPE, Gen. Ins. 178 (1921) 26.

Front of head reduced; mandibles moderately long, curved; antennæ thick, subserrate, longer than body in male, slender and shorter than body in female; lateral margin of prothorax generally present; mesonotum with a medially grooved, stridulatory area; elytra more than twice as long as broad, rounded apically and feebly costate.

Genotype.—*Philus inconspicua* Saund. (*Stenocorus antennatus* Gyllenh.)

Range.—China; Hainan; Formosa; Siam; Malacca; Borneo; northern India.

Key to the Hainan species of *Philus*.

1. Blackish brown; dorsal surface hairy; prothorax largely dull; ventral surface and legs hairy in female..... *antennatus*.

Testaceous to reddish brown; elytra nearly glabrous; prothorax largely smooth, shiny; ventral surface and legs fairly glabrous in female.

pallescens tristis.

PHILUS ANTENNATUS (Gyllenhal).

Stenocorus antennatus GYLLENHAL in Schönherr, Syn. Ins. 3 (1817) append. 180.

Philus inconspicua SAUNDERS, Trans. Ent. Soc. London (2) 2 (1853) 110, pl. 4, figs. 3, 4, North China.

Philus antennatus LACORDAIRE, Gen. Col. 8 (1869) 160, pl. 83, fig. 2; HEYDEN, Deutsche Ent. Zeitschr. 30 (1886) 287; GAHAN, Ann. & Mag. Nat. Hist. (7) 5 (1900) 347, Hainan; BOPPE, Gen. Ins. 179 (1921) 27, pl. 1, fig. 11, pl. 2, figs. lab.

Female.—Large, elongate, slightly narrowed posteriorly. Dull blackish brown; ventral surface and apical halves of elytra somewhat reddish. Body almost entirely clothed with tawny hairs, shortest and sparsest on elytra, densest on ventral surface and legs.

Head about as broad as prothorax, gradually narrowed behind the swollen eyes, densely punctured above. Antennæ slender, slightly more than one-half as long as body; scape short, hairy; following segments thinly pubescent; third segment one and one-half as long as scape, one and one-third as long as fourth and following segments, which are subequal. Prothorax broader than long, cylindrical and constricted anteriorly, flattened basally, finely punctulate; disc with four small, partially impunctate, shiny areas forming a trapeze. Scutellum rounded-truncate behind. Elytra more than four times as long as head and prothorax united, vermiculate-punctate; each with four distinct longitudinal costæ. Ventral surface and legs densely and finely punctured; first hind tarsal segment shorter than following two segments united.

Length, 31 millimeters; breadth, 9.2.

A single specimen, in the Lingnan Natural History Museum, was taken on Hainan Island, April 28 and 29, 1932, by Prof. W. E. Hoffmann.

Distribution.—Northcentral and southeastern China; Hainan Island.

PHILUS PALLESCENS⁴ **TRISTIS** Gressitt subsp. nov. Plate 1, figs. 4 and 5.

Male.—Reddish brown; head and prothorax dark brown above; antennæ dusky brown; elytra testaceous beyond base; legs and ventral surface reddish brown, hairy in male, subglabrous and brighter in female.

⁴ *Philus pallescens* Bates, Proc. Zool. Soc. London (1866) 350, Formosa.

Form subelongate. Head with mandibles long; frons, clypeus, and genæ greatly abbreviated; eyes large, emarginate, inferior lobe subglobular. Antennæ one and one-half as long as body; third and following segment subequal in length, slightly toothed apically, each about twice as long as scape, which is nearly as thick as long; prothorax very small, no broader than head, narrowed apically, fairly smooth above, finely punctured. Elytra long, slightly narrowed behind humeri, rounded apically, densely and finely punctured over entire surface, each with three or four weak, longitudinal, raised lines reaching nearly to apex. Femora weakly swollen, barely reaching beyond middle of abdomen; first hind tarsal segment hardly as long as following two segments combined.

Female.—Antennæ three-fifths as long as body, untoothed at apices of segments.

Length, 17 to 18 millimeters; breadth, 5.5.

Holotype, male, Musée Heude, Sam-a, southern Hainan Island, May 3, 1936; allotype, female, April 30, 1936; both collected by Commander G. Ros.

Differs from the typical form from Formosa and specimens from the Kwangtung mainland in being duller, less reddish, more hairy, and in having the elytra shorter, particularly in the female, the hind tibiae shorter, the anterior femora more heavily punctured, the pedicel less globular in the female and more so in the male, and in other characters. The male differs from the male of *P. costatus* Gahan, of Siam, in being darker, particularly on the head, antennæ and prothorax, and in having the eyes more approximate above, the neck finer, prothorax narrower, and elytra shorter. Differs from *P. antennatus* (Gyllenhal) in having the elytra paler, less hairy and shorter, and in other characters.

Distribution.—Hainan Island.

DISTENIINÆ

DISTENITÆ Thomson, *Classif. Ceramb.* (1860) 181; *Syst. Cer.* (1864) 225.

DISTENIIDES Lacordaire, *Gen. Col.* 9 (1869) 225.

DISTENIINÆ Pascoe, *Trans. Ent. Soc. London* (3) 3 (1869) 655; Gahan, *Fauna Brit. India Col.* 1 (1906) 58; Boppe, *Gen. Ins.* 178 (1921) 2; Craighead, *Dept. Agric. Canada Tech. Bull.* 27 (1923) 99; Matsushita, *Journ. Fac. Agr. Hokkaido Imp. Univ.* 34 (1933) 167.

DISTENIINI Leconte and Horn, *Classif. Col. N. Amer.* (1883) 307; Aurivillius, *Col. Cat.* 39 (1912) 7; Liu, *Lingnan Sci. Journ.* 12 (1933) 473, 475.

Head abbreviated anteriorly, elongated and narrowed behind eyes; eyes vertical, entire or weakly emarginate; maxillary palpi longer than labial palpi; mesonotum with stridulatory area divided by a median line; metepisternum narrow, acute apically; anterior coxal cavities generally rounded and open behind; anterior tibiae generally with a feeble, oblique groove internally, middle tibiae with an oblique, preapical, external depression.

This subfamily, which has frequently been considered a tribe of the subfamily Cerambycinae, was first made to include the genera *Cyrtonops* and *Dynamostes* by Gahan in 1906. Though properly belonging in this subfamily they both differ considerably from the rest of the genera taken as a whole, and from each other. I therefore propose to divide the subfamily into three tribes, to represent more clearly the natural divisions existing among the genera.⁵ The typical tribe, which includes all the genera except *Cyrtonops* and *Dynamostes*, is the only one as yet known to occur in Hainan.

⁵ Tribus CYRTONOPINI novum

MONODESMIDES Lacordaire, Gen. Col. 8 (1869) 157, part.

DISTENINAE Gahan, Fauna Brit. India Col. 1 (1906) 58; Boppe, Gen. Ins. 178 (1921) 2, part.

Head short behind; eyes prominent; maxillary palpi of male with second and fourth segments very long; antennae shorter than body, lacking a long fringe of hairs internally; prothorax short, tuberculate; elytra less than three times as long as broad; anterior coxal cavities angulate externally, open behind; middle coxal cavities open exteriorly to epimera.

This tribe is erected for the Oriental genus *Cyrtonops* White [Type: *C. punctipennis* White, Cat. Col. Brit. Mus 7 (1853) 23, pl. 2, fig. 3.] which should be expected to occur in Hainan or South China. Lacordaire placed *Cyrtonops* in his Groupe Monodesmides of the subfamily Prioninae with some uncertainty.

Tribus DYNAMOSTINI nomen novum

DYNAMOSTIDES Lacordaire, Gen. Col. 8 (1869) 196.

Head elongated and gradually narrowed behind eyes; mandibles large, toothed basally on inner edge; eyes narrow; antennae shorter than body, lacking long internal fringes, scape longer than third segment; prothorax subcylindrical, longer than broad; elytra less than three times as long as broad; anterior coxal cavities rounded, open posteriorly; pre-sternal process broad, dilated behind; middle coxal cavities closed externally to epimera, femora moderately thick; tibiae spined externally, hind pair indented before apex of inner side.

This tribe is made for the genus *Dynamostes* Pascoe [type: *D. audax* Pascoe, Trans. Ent. Soc. London (2) 4 (1857) 90, pl. 22, fig. 1, Sikkim].

Key to the tribes of the subfamily Disteniinæ.

1. Antennæ shorter than body, lacking a fringe of long hairs internally; elytra less than three times as long as broad; femora broad..... 2.
- Antennæ longer than body, slender, bearing a fringe of long hairs internally; elytra three or more times as long as broad; femora slender or clubbed apically DISTENIINI.
2. Head short behind eyes; maxillary palpi of male very long; eyes large; prothorax laterally tuberculate; anterior coxal cavities angulate externally and open posteriorly; middle coxal cavities open externally; tibiæ simple CYRTONOPINI.
- Head elongated behind eyes; maxillary palpi of male normal; eyes moderate; prothorax cylindrical; anterior coxal cavities rounded, open posteriorly; middle coxal cavities closed externally; tibiæ spined externally, hind pair indented preapically..... DYNAMOSTINI.

DISTENIINI

DISTENITÆ Thomson, *Classif. Ceramb.* (1860) 181; *Syst. Ceramb.* (1864) 225.

DISTENIIDES Lacordaire, *Gen. Col.* 9 (1869) 225.

DISTENIINÆ Pascoe, *Trans. Ent. Soc. London* (3) 3 (1869) 655; Gahan, *Fauna Brit. India Col.* 1 (1906) 58, part; Boppe, *Gen. Ins.* 178 (1921) 2, part.

DISTENIINI Leconte and Horn, *Classif. Col. N. Amer.* (1883) 307.

Form slender; elytra three or more times as long as broad; neck constricted; eyes generally entire, moderately large; antennæ slender, longer than body, bearing a fringe of long, fine hairs internally, frequently hidden in a groove; prothorax swollen or tuberculate at either side, constricted near apex and base; anterior coxal cavities subapproximate, rounded, open behind.

Genus NOEMIA Pascoe

Noemia PASCOE, *Trans. Ent. Soc. London* (2) 4 (1857) 111; *ibid.* (3) 3 (1869) 656; THOMSON, *Classif. Ceramb.* (1860) 182; *Syst. Ceramb.* (1864) 442; LACORDAIRE, *Gen. Col.* 9 (1869) 228; BOPPE, *Gen. Ins.* 178 (1921) 9.

Nethinius FAIRMAIRE, *Bull. Soc. ent. Belg.* 33 (1889) 94; *Ann. Soc. ent. Belg.* 41 (1897) 197; *Ann. Soc. ent. France* 48 (1899) 119.

Form slender, subparallel; eyes finely faceted, almost entire, lateral, behind antennal insertions, distant above; last maxillary palpal segment enlarged; antennæ twice as long as body, segments subequal in length, except second; prothorax longer than broad, swollen at middle, constricted before and behind; elytra rounded apically; prosternal intercoxal process very narrow, extending nearly to posterior borders of coxæ; mesosternal process

broad, emarginate apically; middle coxal cavities closed externally to epimera; femora pedunculate-clavate; tibiae subsinuate.

Genotype.—*Noemia flavicornis* Pascoe.

Range.—Oriental Region (Java, Sumatra, Borneo, Malacca, Philippines, Formosa, Hainan); Madagascar.

NOEMIA SUBMETALLICA Gressitt sp. nov. Plate 2, fig. 1.

Male.—Narrow, subparallel, fragile; elytra deeply punctured. Tricolored: body black, shiny on head; labrum and palpi testaceous; antennae ochraceous basally, apical portions of segments commencing with third gradually darker, seventh and eighth segments almost entirely brown, ninth, tenth, and basal two-thirds of last segment pale testaceous; prothorax black, silvery-pubescent; elytra shiny, dark green on basal two-thirds above, remainder slightly iridescent purplish black, basal portions of tibiae brownish black; tarsi and apices of tibiae slightly brownish. Body furnished with fine, erect, pale hairs, third to tenth antennal segments with very long pale hairs below.

Head longer than broad, nearly as wide as prothorax, swollen below, very finely and sparsely punctured; eyes reniform; antennal supports slightly projecting anteriorly, placed in front of eyes; frons vertical, minute; clypeus twice as broad as long; labrum wider and shorter; palpi with last segment of each pair broadly swollen. Antennae fine, one and two-thirds as long as body; scape pedunculate, arched, strongly swollen in apical two-thirds; subequal to third and following segments, last shortest. Prothorax longer than broad, constricted near apex and base and obtusely tuberculate laterally; cylindrical apical and basal portions finely striolated transversely; disc sparsely and shallowly punctate, finely midlongitudinally sulcate postmedially. Scutellum very narrow. Elytra elongate, slightly narrowed in middle half, rounded externally at apices; surface deeply punctured in about nine longitudinal lines, except at apex. Ventral surface finely and sparsely punctured; metasternum exceedingly narrow. Legs with femora clavate, hind pair each with a deep, oblique, impression on inner side; tarsi with third segment lobed to base, large and dilated, last short.

Length, 11 to 25 millimeters; breadth, 2.25.

Holotype, male, No. 52178 United States National Museum, Ta-han, central Hainan Island, altitude 750 meters, June 23, 1935, taken by the author; paratype, male, Lingnan Natural History Museum, Tai-pin-ts'uen (Dwa-Bi), central Hainan, April 25 and

26, 1935, taken by F. K. To, and paratype, male, in the author's collection, same data.

Close to *N. mindanaoensis* Gressitt in structure, but with the eyes more prominent, the thorax less smooth and more strongly swollen at sides, the elytra longer and the femora more strongly clavate. Differs from *N. flavicornis* Pascoe in having the antennæ largely darker, the rest of the body with the disc of pronotum and only part of elytra blue, instead of largely blue. This is the northernmost species of the genus except for *N. incompta* Gressitt, of Formosa, which is the only entirely non-metallic species. The type was beaten from the branch of a living tree during the daytime.

Distribution.—Hainan Island.

LEPTURINÆ

LEPTURIDÆ Leach, Encyclop. Edinburgh 9 (1815); Stephen, Illustr. Brit. Ent. Man. 4 (1831) 253.

LEPTURIDES, DERECEPHALIDES, Mulsant, Col. France Long. ed. 1 (1839) 212; *ibid.* 2 (1862) 25, 437.

LEPTURIDES, DORCASONIDES, APATOPHYSIDES, VESPERIDES Lacordaire, Gen. Col. 8 (1869) 256, 424; *ibid.* 9 (1869) 236.

LEPTURINÆ Gahan, Fauna Brit. Ind. Col. 1 (1906) 68; Boppe, Gen. Ins. 39 (1922) 11.

LEPTURINI Aurivillius, Col. Cat. 39 (1912) 157.

Head narrowed posteriorly behind eyes, forming a distinct neck; genæ elongate; apical palpal segments ovoid or fusiform; antennæ inserted before, or between, eyes; eyes large, convex, generally entire and finely granulated; prothorax not margined; stridulatory area of mesonotum, if present, divided longitudinally; anterior coxæ contiguous, conical, angulate externally; metepisternum narrowed posteriorly; tarsi elongate.

LEPTURINI

LEPTURINI Aurivillius, Col. Cat. 39 (1912) 157, part; Boppe, Gen. Ins. 139 (1922) 14; Swaine and Hopping, Canad. Dept. Mines Bull. 52 (1928) 1-9.

Neck distinct; antennæ inserted between eyes behind level of their anterior border; eyes slightly emarginate, finely granulated; prothorax campanuliform, rarely tuberculate; posterior femora rarely reaching elytral apices; first hind tarsal segment generally longer than following two united; third tarsal segment not deeply cleft.

Key to the Hainan genera of Lepturini.

1. Antennæ serrate; head broad anteriorly; elytra subparallel..... *Ephies*.
 Antennæ slender, not serrate; head attenuated anteriorly; elytra narrowed and constricted posteriorly *Strangalia*.

Genus EPHIES Pascoe

Ephies PASCOE, Proc. Zool. Soc. London (1866) 506; LACORDAIRE, Gen. Col. 8 (1869) 453; GAHAN, Fauna Brit. India Col. 1 (1906) 87; BOPPE, Gen. Ins. 179 (1921) 105.

Head fairly broad across genæ; frons squarish; neck suddenly constricted behind eyes; antennæ broadly serrate, nearly as long as body in male, one-half as long as body in female; prothorax campanulate, bases strongly sinuate, acutely produced at either side, nearly as broad as base of elytra; elytra subparallel, subobliquely truncate and externally subacute at apices; hind femora barely extending beyond third abdominal segment in male; tibial spines long.

Genotype.—*Ephies cruentus* Pascoe.

Range.—India; Laos; Yunnan; Hainan; Formosa; Malacca; Sumatra; Borneo; Philippines.

EPHIES GAHANI Gressitt sp. nov. Plate 2, fig. 3.

Male.—Moderately slender, gradually narrowed posteriorly. Elytra and prothorax entirely red; head red except for eyes, occiput, middle of frons, and tips of mandibles; anterior coxæ, anterior surfaces, and apices of anterior femora and tibiæ and spurs of middle and hind legs red; antennæ, scutellum, middle and hind thorax, abdomen, middle and hind legs, and remainder of forelegs black; mesosternal intercoxal process, inner sides of middle coxæ, and outer sides of middle femora tinged with reddish. Body clothed with recumbent red hairs on dorsal surface, with silvery pubescence on coxæ, meso- and metathoraces, and bases of first three abdominal segments, black hairs on other parts; posterior margins of first three abdominal segments glabrous and impunctate.

Head longer than broad, barely wider than antemedian swollen portion of prothorax, strongly constricted behind eyes; preocular portion, excluding trophii, broader than long, weakly narrowed anteriorly; frons as broad as long, shallowly grooved midlongitudinally; frons, vertex, and occiput microscopically punctulate; clypeus, genæ, and anterior portion of neck distinctly punctured. Antennæ five-sixths as long as body; fourth to tenth

segments strongly serrate; third segment slightly expanded externally at apex; fourth segment practically as long as third or fifth. Prothorax hardly longer than broad, narrow apically, swollen before middle, acutely expanded at each side of base; basal margin convexly produced over base of scutellum; surface finely punctulate. Scutellum narrowly triangular. Elytra gradually narrowed posteriorly; apices obliquely truncate, subacuminate at external angles; suture dehiscent just before apices; surface finely and evenly punctured. Hind tarsi longer than hind tibiae, laterally compressed; first segment as long as remaining segments together; posterior tibial spines nearly one-half as long as first tarsal segment.

Female.—Head entirely red above; mesosternal intercoxal process entirely red; antennae fully one-half as long as body, segments relatively thicker, but less distinctly serrate than in male; abdomen exceeding elytra, last segment subtruncate apically.

Length, 12 to 15 millimeters; breadth, 2.85 to 4.

Holotype, male, in the Lingnan Natural History Museum, Nam-po, Hainan Island, May 27, 1932, taken by F. K. To; allotype, female, in the author's collection, same data.

Differs from *E. coccineus* Gahan of India in having the elytra relatively shorter and much more narrowed, the antennae more strongly serrate in the male, the head and prothorax more largely red, the elytra more obliquely truncate, and the hind tarsi longer and slenderer.

Distribution.—Hainan Island.

Genus STRANGALIA Serville

Leptura LINNÆUS, Syst. Nat. ed. 10 (1758) 397, part.

Strangalia SERVILLE, Ann. Soc. ent. France 4 (1875) 220; LACORDAIRE, Gen. Col. 8 (1869) 450, part; LINSLEY, Pan Pacific Ent. 14 (1938) 107.

Stenura FAIRMAIRE, Ann. Soc. ent. France (6) 9 (1889) 59, not of Ganglbauer.

Strangalina AURIVILLIUS, Col. Cat. 39 (1912) 240; BOPPE, Gen. Ins. 178 (1921) 102.

Head more or less attenuated anterior to eyes; last maxillary palpal segment three or four times as long as broad; antennae generally about as long as body, slender; prothorax campanulate, longer than broad, frequently constricted preapically; elytra long, attenuated and generally constricted postmedially; hind legs long; hind tarsi usually longer than hind tibiae, laterally compressed.

Genotype.—*Leptura luteicornis* Fabricius.

Range.—Palæarctic, Nearctic, and northern Oriental Regions.

Key to the Hainan species of Strangalia.

1. Testaceous, striped on pronotum and spotted on elytra with black; antennæ black preapically *lateripicta loimailia*.
Head and thorax black; elytra dull brown; antennæ white preapically.
longicorne obscura.

STRANGALIA LATERIPICTA ⁶ **LOIMAILIA** Gressitt subsp. nov.

Female.—Elongate, laterally compressed, attenuated posteriorly. Ochraceous; head with apices of mandibles and sides of occiput black; antennæ dark, first five segments largely ochraceous brown with inner sides and apices brownish black, sixth and seventh segments brownish basally, following segments black, last segment tipped with pale; prothorax with a longitudinal black stripe on either side of disc, from base to apex, broadest at base; elytra yellowish ochraceous, suture, external margins, and apices narrowly black, three black marks extending from external margin to midline of each, first two black marks squarish, last longitudinal, centered at first, second, and third fifths, respectively; hind thorax, abdomen, coxæ, and femora yellowish testaceous, last abdominal segment and apical thirds of hind femora and tibiæ black; tibiæ reddish ochraceous; tarsi brownish black. Body almost entirely clothed with oblique, golden-brown hairs; antennal hairs largely dark.

Head elongated, subparallel anterior to eyes, constricted at posterior borders of eyes, densely punctulate on occiput and sides of frons, sparsely punctured on neck, genæ, and clypeus; eyes longitudinally oval. Antennæ as long as body, slender, thickened apically; third segment longer than scape, fourth and sixth segments subequal to fifth; basal segments slightly thickened apically; subapical segments cylindrical. Prothorax one and one-half times as long as broad at base, narrowed anteriorly, weakly rounded before middle of each side, moderately expanded at base; basal margin convex at center; surface densely punctulate. Scutellum acutely triangular. Elytra strongly narrowed from base to apical third, dehiscent apically; apices narrowly and obliquely truncate, acuminate externally; surfaces distinctly punctate. Meso- and metathoraces densely punctulate; abdomen more sparsely punctate, first four segments regularly decreasing

⁶ *Leptura* (*Strangalia*) *lateripicta* FAIRMAIRE, Ann. Soc. ent. Belg. 39 (1895) 178.

in length, last truncate below. Hind tarsus shorter than tibiæ, first segment one and one-fourth as long as remaining segments together.

Length, 13 to 14 millimeters; breadth, 2.8 to 3.2.

Holotype, female, in the Lingnan Natural History Museum, foot of Lai-mo-Ling (Loi Mother Mountain, Loi Mai Lia), central Hainan, altitude 400 meters, May 28 to 30, 1935, F. K. To; paratopotype, female, in the author's collection, near Tai-pin-ts'uen (Dwa-Bi), foot of Loi Mother Mountain, May 25 to 28, 1935, F. K. To.

Differs from typical *Strangalia lateripicta* (Fairmaire) from Tonkin in having the head narrower than the prothorax, the subapical antennal segments entirely black, the pronotum striped laterally, instead of unicolorous, in the female, the elytra partially banded, instead of irregularly striped laterally, the first four abdominal segments entirely testaceous, the hind tibiæ largely ochraceous, and in other characters. This form is apparently also very closely related to *Strangalia vittaticollis*⁷ Pic. It differs from *S. gracilis* Gressitt, of the northern Ryu Kyu (Loochoo) Islands, in being more heavily punctured, in having the hind legs, particularly the tarsi, shorter, the head less black, the prothoracic disc laterally and longitudinally striped for the entire length, the elytral bands not reaching the suture, the ventral surface less black, and in other characters.

Distribution.—Hainan Island.

STRANGALIA LONGICORNE⁸ OBSCURA Gressitt subsp. nov.

Female.—Slender, laterally compressed, attenuated posteriorly. Head and thorax black, except for brownish palpi, apices of labrum and clypeus, coxæ, and middle of metasternum; antennæ dull brownish basally, seventh and eleventh segments nearly black, eighth to tenth segments buffy white; scutellum black; elytra dull chestnut brown, with apices, lateral spots at ends of first and second fifths of each, black; abdomen ochraceous, dull brown on last two segments and posterior margins of first three; legs dull castaneous, apices of hind femora and posterior sides of hind tibiæ and first tarsal segments blackish. Body clothed with tawny-golden pubescence, blackish on elytra and silvery buff on ventral surface.

⁷ Mel. Exot. Ent. 45 (1926) 22, Tonkin.

⁸ *Strangalina longicorne* Gressitt, Philip. Journ. Sci. 55 [1934 (1935)] 382.

Head moderately elongate anteriorly, densely punctured, except for apical triangle of frons, and apices of clypeus and labrum; vertex finely grooved. Antennæ one and one-fifth as long as body; third segment barely longer than scape, distinctly longer than fourth and shorter than fifth. Prothorax nearly one and one-half as long as broad at base, weakly constricted preapically; middle of disc swollen and finely punctured; sides densely punctured. Scutellum narrow, blunt. Elytra long, strongly narrowed, subparallel for apical third, dehiscent and subacuminate apically, finely punctured. Metepisternum densely punctulate; basal abdominal segments sparsely punctured apically. Posterior femora exceeding third abdominal segment; first hind tarsal segment distinctly longer than remaining segments united.

Length, 13 millimeters; breadth, 3.

Holotype, female, Lingnan Natural History Museum, Tai-pin-ts'uen (Dwa-Bi), near Loi Mother Mountain, central Hainan, altitude 400 meters, May 5 to 7, 1935, F. K. To.

Differs from *Strangalia longicorne* (Gressitt) comb. nov. from Amami-Oshima Island, northern Ryu Kyu (Loochoo) Islands, in having the head narrower anteriorly, the antennæ slenderer, the pronotum much more swollen and finely punctate above and narrower apically, the elytra darker, with two lateral, instead of one sublateral, black spots anteriorly, the abdomen largely ochraceous instead of black, the femora much darker and the tarsi longer.

Distribution.—Hainan Island.

CERAMBYCINÆ

CERAMBYCIDÆ Fabricius, Ent. Syst. 1, 2 (1792) 251-357, part; Pascoe, Trans. Ent. Soc. London (3) 3 (1869) 49-660, part.

CERAMBYCITÆ Thomson, Syst. Cer. (1864) 157-270, 332-336, 414-464, part.

CERAMBYCIDES Lacordaire, Gen. Col. 8 (1869) 192-543; *ibid.* 9 (1869) 1-237.

CERAMBYCINI Ganglbauer, (Bestimm.-Tabell. Eur. Col. 7) Verh. zool.-bot. Ges. Wien 31 (1881) 687.

CERAMBYCINÆ Gahan, Fauna Brit. India Col. 1 (1906) 90-322.

CERAMBYCIENS Planet, Encyclop. Ent. 2 (1924) 118.

Both lobes of maxillæ developed; palpi blunt apically; mentigerous process of gula absent or reduced; antennæ generally inserted close to eyes and more or less distant from bases of mandibles; neck rarely distinctly constricted behind eyes; pro-

thorax not margined at sides; wing venation generally reduced by loss of Cu_2 or Cu_1 , or both; mesonotum with a stridulatory area which is rarely divided by a median line; anterior coxæ depressed, rarely strongly angulate externally; anterior tibiæ not obliquely grooved interiorly, and middle tibiæ not notched exteriorly.

This subfamily is second only to the Lamiinæ in size within the family Cerambycidae. It has frequently been made to include the Disteniinæ and Lepturinæ, Aurivillius(1) having treated the subfamily in that sense.

Key to the Hainan tribes of Cerambycinæ.

1. Eyes coarsely faceted 2.
Eyes finely faceted 5.
2. Middle coxal cavities open externally to epimera..... 3.
Middle coxal cavities closed externally to epimera..... CALLIDIOPSINI.
3. Anterior coxal cavities open behind; prosternal process not dilated and truncated posteriorly; pronotum generally not vermiculated or corrugated; fourth and fifth antennal segments hardly different from third or sixth..... 5.
Anterior coxal cavities generally closed posteriorly; prosternal process dilated and truncated posteriorly; pronotum generally densely vermiculated or corrugated; fourth and fifth antennal segments generally shorter than third and sixth, swollen apically..... CERAMBYCINI.
4. Vertex raised on either side above antennal insertions and grooved medially; maxillary and labial palpi subequal in length; prothorax transverse HESPEROPHANINI.
Vertex nearly plane between antennal insertions; maxillary palpi distinctly longer than labial palpi; mandibles very small; prothorax flattened and carinate above, as long as broad..... ACHRYSONINI.
5. Middle coxal cavities open exteriorly to epimera..... 6.
Middle coxal cavities closed exteriorly to epimera..... 10.
6. Front coxæ subtransverse, distinctly angulated externally..... 7.
Front coxæ more or less rounded, not strongly angulated..... 8.
7. Anterior coxæ subconical, strongly exerted, their cavities generally closed posteriorly MOLORCHINI.
Anterior coxæ not conical nor strongly exerted, their cavities open posteriorly COMPSOCERINI.
8. Prothorax generally tuberculate laterally; antennæ longer than body, at least in male; scutellum moderately large, acute apically..... 9.
9. Anterior coxal cavities widely open posteriorly, first hind tarsal segment generally shorter than following two segments combined.
STENASPINI.
Anterior coxal cavities closed or slightly open posteriorly; first hind tarsal segment generally longer than following two segments combined CALLICHRONINI.

10. Head vertical in front; eyes entire; tarsal claws divergent.

TILLOMORPHINI.

Head inclined in front; eyes emarginate; tarsal claws divaricate.

CLEOMENINI.

ACHRYSONINI

ACHRYSONIDES Lacordaire, Gen. Col. 8 (1869) 231; Bates, Trans. Ent. Soc. London (1870) 247.

ACHRYSONINI Aurivillius, Col. Cat. 39 (1912) 39; Matsushita Journ. Fac. Agr. Hokkaido Imp. Univ. 34 (1933) 221, 241.

Eyes coarsely faceted; middle coxal cavities open externally to epimera; mentum sclerotized; anterior coxal cavities weakly angulate externally; basal margin of prothorax entire; antennæ longer than body, at least in male.

Genus NORTIA Thomson

Nortia THOMSON, Syst. Ceramb. (1864) 252; LACORDAIRE, Gen. Col. 8 (1869) 234.

Head short, nearly plane between antennal insertions; antennæ longer than body, third and following segments subuniform; prothorax flattened, rounded laterally, tricarinate above; elytra long, rounded apically; prosternal intercoxal process narrow; mesosternal process broad and plane; femora broad and strongly flattened; first four abdominal segments gradually decreasing in length.

Genotype.—*Nortia cavicollis* Thomson.

Range.—Moluccas; Philippines; Formosa; Hainan.

The following new form from Hainan is the third species of the genus to be made known. The genus has not been recorded from the mainland of Asia.

NORTIA GENICULATA Gressitt sp. nov.

Male.—Elongate, dorsoventrally compressed, weakly narrowed posteriorly. Dull reddish brown; head and prothorax nearly black; antennæ light reddish brown, nearly testaceous towards apices; legs yellowish testaceous, apical fifth of each femur black. Body clothed with fine, pale pubescence, densest on pronotum; antennæ with a fringe of short hairs on inner sides.

Head abbreviated anteriorly; clypeus and labrum very short; eyes nearly touching mandibles, deeply emarginate; frons short, transversely grooved before apex; vertex weakly concave between antennal insertions; surface granulose; last maxillary palpal segment obliquely truncate apically. Antennæ one and one-half

as long as body, cylindrical, gradually tapering, fringed internally; scape one-half as long as third segment; third to tenth segments gradually diminishing in length; last segment as long as fifth. Prothorax depressed, as broad as long, evenly rounded apically. Elytra twice as long as head and prothorax combined, slightly narrowed posteriorly, separately rounded apically; surface deeply and regularly punctured, subseriately in part. Prosternal intercoxal process strongly narrowed posteriorly; mesosternal process broad; metasternum subasperate-punctate. Femora strongly compressed, hind pair not reaching elytral apices; first hind tarsal segment longer than following two segments combined.

Length, 22.6 millimeters; breadth, 4.

Female.—Antennæ barely longer than body.

Length, 29.5 millimeters; breadth, 4.4.

Holotype, male, Lingnan Natural History Museum, Nam-pots'uen, Loi territory, Ch'eng-mai district, Hainan Island, August 28 to 31, 1935, F. K. To; allotype, female, in the author's collection, Tai-tsing-lam-ts'uen, near Loi Mother Mountain, June 6, 1935, F. K. To.

Differs from *N. carinicollis* Schwarzer of Formosa in being smaller, with the scape shorter and more parallel, the femora more compressed, the pronotum less strongly carinate along the midline, the dorsal surface darker, the femora testaceous except for their black apices, and the antennæ paler.

Distribution.—Hainan Island.

CERAMBYCINI

CERAMBYCIDES VRAIS Lacordaire, Gen. Col. 8 (1869) 246.

CERAMBYCINÆ Pascoe, Trans. Ent. Soc. London (3) 3 (1869) 507;

Gahan, Ann. & Mag. Nat. Hist. (6) 6 (1890) 247.

CERAMBYCINI Gahan, Fauna Brit. India Col. 1 (1906) 119.

Head rough, generally grooved between antennal insertions and with one or two transverse grooves across frons, with a pit at either side; eyes deeply emarginate, coarsely faceted; antennæ frequently at least twice as long as body in male, fourth, or fourth and fifth segments generally shorter than third and sixth, swollen apically; pronotum often coarsely vermiculose or corrugated and pitted; anterior coxal cavities generally closed externally; prosternal intercoxal process dilated and truncate apically; middle coxal cavities open exteriorly to epimera; first abdominal segment relatively long; tarsal claws divaricate.

Key to the Hainan genera of Cerambycini.

1. Anterior coxal cavities strongly angulate exteriorly; antennæ not spined internally; prothorax strongly spined laterally; elytra smooth and thinly clothed with fine, even pubescence..... 2.
Anterior coxal cavities rather weakly angulate exteriorly; prothorax weakly, or not at all, tuberculate laterally; elytra sometimes with pubescence lying in different directions, giving a variable pattern.... 3.
2. Occiput carinate between eyes; antennal scape subarched, swollen apically; elytra toothed externally at apices..... *Plocæderus*.
Occiput deeply sulcate between eyes; antennal scape flattened-cylindrical, parallel; elytra rounded externally at apices..... *Nadhezdiella*.
3. Third and following antennal segments lacking a distinct, flattened margin externally 4.
Third and following antennal segments with a distinct, flattened margin externally; antennæ but little longer than body in male; prothorax rounded laterally; elytra truncate apically..... 6.
4. Prothorax not longer than broad; antennæ not distinctly fringed internally in male, or else spined internally on postbasal segments..... 5.
Prothorax longer than broad; antennæ distinctly fringed interiorly, not spined internally on postbasal segments..... *Dialeges*.
5. Third to sixth or eighth antennal segments not spined internally at apices; elytra truncate or weakly emarginate apically; prosternal intercoxal process somewhat produced posteriorly..... *Æolesthes*.
Third to sixth or eighth antennal segments distinctly spined endoapically; elytra each distinctly bispinous apically; prosternal intercoxal process not produced, weakly truncate..... *Trirachys*.
6. Prothoracic disc irregularly vermiculose longitudinally; elytra entirely and evenly clothed with thin pubescence; prosternal intercoxal process acutely tuberculate *Trachylophus*.
Prothoracic disc with about eighteen deep longitudinal grooves, strongly constricted transversely before apex; prosternum intuberculate.

Rhytidodera.Genus *PLOCÆDERUS* Thomson*Plocæderus* THOMSON, Classif. Ceramb. (1861) 197; LACORDAIRE, Gen.

Col. 8 (1869) 254; GAHAN, Fauna Brit. India Col. 1 (1906) 120.

Plocæderus GEMMINGER and HAROLD, Cat. Col. 9 (1872) 2799.

Head weakly concave between the moderately raised antennal tubercles, not concave between upper eye lobes; antennal scape arched, swollen preapically; antennæ nearly twice as long as body in male, barely as long as body in female, fifth to tenth segments subequal in length; prothorax broader than long, sharply spined at each side, irregularly vermiculate on disc; elytra three times as long as broad, truncate apically with a small spine at each sutural angle; anterior coxal cavities angulate exteriorly; anterior intercoxal process finely tuberculate posteriorly.

Genotype.—*Plocæderus cyanipennis* Thomson.

Range.—Ethiopian Region; central and southwestern Asia; Oriental Region.

PLOCÆDERUS OBESUS Gahan. Plate 1, fig. 3.

Plocæderus obesus GAHAN, Ann. & Mag. Nat. Hist. (6) 5 (1890) 51;

ibid. (6) 6 (1890) 259; Fauna Brit. India Col. 1 (1906) 121, fig. 47.

Plocæderus pedestris COTES (nec. White), Ind. Mus. Notes (1) 2 (1889) 91, pl. 5, fig. 4.

Male.—Reddish brown, eyes, outer sides and apices of basal antennal segments, apices of femora, and trochanters, black; dorsal surface of body clothed with thin, silky, buff pubescence, densest on scutellum, ventral surface clothed with longer, inclined, buff hairs, longest on metasternum; basal two maxillary palpal segments glabrous, apical two segments hairy.

Head granulose-punctate in front, swollen and granulose on occiput; eyes large, deeply constricted, inferior lobes several times larger than superior lobes; genæ very short. Antennæ one and three-fourths times as long as body; scape swollen, arched, densely but irregularly punctured; following segments granulose or finely asperate; a smooth, but dull, dorsolateral, concave, parallel strip on outer sides of segments from apex of fifth segment to apex of last; third and fifth to tenth segments subequal in length, each one and one-half as long as fourth and one and one-third as long as scape. Prothorax with anterior margin weakly convex, basal margin biconcave; each side with a sharp, slightly backward curving spine, a lateral swelling before each spine; disc coarsely vermiculate, a transverse ridge near apex and another near base. Elytra gradually narrowed in basal three-fourths; surface microscopically vermiculate-punctate; apices truncate, with a tooth at each angle. Ventral surface minutely punctulate; femora and tibiæ angulate in cross section; first hind tarsal segment as long as following two segments united.

Length, 44 to 46 millimeters; breadth, 15 to 16.

Female.—Antennæ about as long as body; last abdominal segment weakly emarginate-truncate.

Length, 25 to 38 millimeters; breadth, 9 to 12.

Specimens in Lingnan Natural History Museum, from a grove two miles southwest of Nodda, June 28, 1929, Lingnan Univ. Fifth Hainan Exped.; 1 male, "Hainan Is., Oct. 1932"; Nodda, west central Hainan (found with its calcareous pupal cocoon); and 1 female, "Triangular Mt.", Hainan, June, 15, 1932, F. K. To; 1 male, Dwa-Bi (Tai-pin-ts'uen), central Hainan, altitude

350 meters, July 23, 1935, taken by the author (shaken from dead tree at night); 1 female, Nam-fung, west central Hainan, and 1 female, Five Finger Mountains, southcentral Hainan, April 25, 1932, F. K. To, in the author's collection; 2 specimens, Sam-a, southern Hainan, May 5, 1936, G. Ros, in collector's collection; 1 specimen, same data, in Musée Heude.

Distribution.—India; Burma; Siam; Andaman Island; Hainan Island.

Genus NADEZHDIELLA Plavilstshikov

Nadezhdiella PLAVILSTSHIKOV, Bestimm.-Tabell. eur. Col. 100 (1931) 71; GRESSITT, Lingnan Sci. Journ. 16 (1937) 91.

Antennal supports overhanging internally; frons with two deep, oblique grooves; occiput deeply sulcate between superior eye lobes; antennæ over one and one-half times as long as body in male, slightly shorter than body in female, scape broad, weakly swollen apically, fourth segment two-thirds as long as third and fifth, third and fourth segments moderately swollen apically; prothorax transverse, coarsely and irregularly vermiculose above, with a slightly raised area on either side of middle of disc, strongly and sharply spined laterally; elytra long, subparallel, smooth, rounded apically; anterior coxal cavities acutely and weakly angulate externally, barely closed posteriorly; prosternal intercoxal process depressed, subtruncate posteriorly; mesosternal process concave and angulately emarginate apically; first hind tarsal segment shorter than following two united.

Genotype.—*Cerambyx cantori* Hope.

Range.—Western and southern China; Hainan; Formosa; Siam.

NADEZHDIELLA CANTORI (Hope).

Cerambyx cantori HOPE, Trans. Ent. Soc. London 4 (1845) 11, Chusan Island, East China; LACORDAIRE, Gen. Col. 8 (1869) 251, note 2; GAHAN, Ann. & Mag. Nat. Hist. (6) 6 (1890) 249; KATO, Three Color. Illus. Ins. Japan 9 (1933), pl. 18, fig. 6.

Cerambyx scabricollis CHEVROLAT, Rev. Zool. (2) 4 (1852) 416, Hongkong.

Cerambyx lucasi BRONGNIART, Nouv. Arch. Mus. Paris (3) 3 (1891) 238, pl. 10, fig. 1.

Nadezhdiella cantori PLAVILSTSHIKOV, Bestimm.-Tabell. eur. Col. 100 (1931) 71; GRESSITT, Lingnan Sci. Journ. 18 (1939) 12.

Male.—Entirely black; body clothed with fine, silky, silver-gray pubescence, very thin on elytra and denser on ventral surface and antennæ.

Antennal supports subacutely raised at each side, interiorly overhanging the deeply grooved middle of vertex; frons with a very deep depression at either side of middle; occiput deeply grooved between superior eye lobes, slightly excavated at each side posteriorly. Antennæ two and two-thirds as long as body; scape pitted and slightly wrinkled; third segment longer than scape, fourth segment shorter than fifth to tenth segments, which are subequal; third and following segments weakly swollen at apices. Prothorax nearly as long as broad, swollen at each side anterior to the acute lateral spine; disc strongly and densely vermiculose in an irregular fashion. Elytra long, subparallel, rounded externally at apices, a small spine at each sutural angle; surface microscopically punctulate.

Female.—Antennæ not quite as long as body, scape smoother, fifth and following segments slightly expanded externally, toothed at apices.

Length, 44 to 50 millimeters; breadth, 12 to 13.5.

Description based on two specimens from Formosa.

Two specimens, in the Lingnan Natural History Museum, were taken, one at Tai-tsing-lam-ts'uen, behind Lai-mo-leng (Loi Mother Mountain), central Hainan, June, 1935, by F. K. To; the other at Lok-kei, near Nodda, June 18 to 21, 1932, by O. K. Lau and F. K. To.

Distribution.—South China; Hainan; Formosa; Siam.

Genus *ÆOLESTHES* Gahan

Æolesthes GAHAN, Ann. & Mag. Nat. Hist. (6) 6 (1890) 250; Fauna Brit. India Col. 1 (1906) 126.

Head deeply pitted on each side of frons, finely sulcate on vertex and deeply so on occiput behind eyes; antennæ over twice as long as body in male, slightly longer than body in female, scape wrinkled, sixth segment longer than third or fifth, third to fifth segments distinctly swollen apically; prothorax broader than long, rounded laterally, disc irregularly wrinkled, a smoother, raised area in middle; elytra slightly uneven, truncate apically, clothed with pubescence lying in different directions, giving a varying pattern; prosternal intercoxal process grooved ventrally, truncate and slightly projecting posteriorly; mesosternal process indented apically; first abdominal segment nearly as long as following two segments combined; first hind tarsal segment as long as succeeding two segments combined.

Genotype.—*Hammaticherus aurifaber* White.

Range.—Oriental Region; Melanesia.

ÆOLESTHES HOLOSERICEA (Fabricius).

Cerambyx holosericea FABRICIUS, Mant. Ins. 1 (1787) 135.

Pachydissus velutinus THOMSON, Syst. Cer. (1865) 576, India.

Pachydissus similis GAHAN, Ann. & Mag. Nat. Hist. (6) 5 (1890) 52.

Neocerambyx holocericeus COTES, Ind. Mus. Notes (1) 2 (1889) 60, pl. 5, fig. 3.

Æolesthes holocericea GAHAN, Ann. & Mag. Nat. Hist. (6) 7 (1891) 20; Fauna Brit. India Col. 1 (1906) 127; MAXWELL-LEFROY, Ind. Ins. Life (1909) 373, fig. 253.

Male.—Black to blackish brown; body clothed with dense pubescence which lies in different directions on elytra, giving patterns of brown and silvery-brown or golden-brown which change according to the angle of vision.

Vertex weakly concave between antennal insertions, finely grooved along middle, pitted at either side before ends of superior eye lobes; eyes deeply emarginate, inferior lobe subtriangular; surface granulose-punctate; submentum with a deep transverse groove. Antennæ two and one-half times as long as body; scape, third and fifth segments subequal in length, much shorter than sixth segment; last segment as long as elytra. Prothorax barely broader than long, coarsely wrinkled, a subrectangular, relatively smooth, raised area centered a little behind middle of disc, preceded by a smaller, subtriangular, concave, raised area. Elytra slightly uneven, weakly sinuate-truncate externally; hind femora nearly reaching elytral apices.

Length, 27 to 42 millimeters; breadth, 7 to 12.

Specimens in Lingnan Natural History Museum, from Namting-ts'suen, 16 kilometers northeast of Sam-ah-kong (Sam-a), southern Hainan, February 12 to 16, 1935, F. K. To; Lohfung-tung, Yai District, Hainan, February 22 to 25, F. K. To; one specimen each from both localities in the author's collection.

New to Hainan.

Distribution.—India; Ceylon; Andaman and Nicobar Islands; Tenasserim, Siam; Malacca; Hainan; Kwangtung.

Genus TRIRACHYS Hope

Trirachys HOPE, Proc. Ent. Soc. London (1841) 61; Trans. Ent. Soc. London 4 (1845) 11; THOMSON, Syst. Ceramb. (1864) 444; LACORDAIRE, Gen. Col. 8 (1869) 257; GAHAN, Ann. & Mag. Nat. Hist. (6) 6 (1890) 251; LIU, Lingnan Sci. Journ. 12 (1933) 480.

Trirrachis GEMMINGER and HAROLD, Cat. Col. 9 (1873) 2801.

Front of head with a transverse, diamond-shaped, raised area surrounded by grooves and, laterally, by pits; vertex weakly

grooved; antennal scape transversely wrinkled. third segment subequal in length to scape, longer than fourth segment, hardly as long as fifth segment, much shorter than sixth and following segments, third to fifth, or seventh, segments spined internally at apices in male, third to tenth distinctly spined in female; prothorax briefly but sharply spined at each side, transversely wrinkled on middle of disc except for a narrow, smoother, raised area behind middle; elytra truncate and bispinous apically; anterior intercoxal process weakly truncate posteriorly.

Genotype.—*Trirachys orientalis* Hope.

Range.—Central and southern China; Hainan; Formosa.

TRIRACHYS ORIENTALIS Hope.

Trirachys orientalis HOPE, Proc. Ent. Soc. London (1841) 61, Chusan Islands, East China; Trans. Ent. Soc. London 4 (1845) 11.

Entirely black; body densely clothed with pubescence which lies in different directions on elytra, making pale-golden to greenish-black patterns according to angle of vision; ventral surface with hairs less closely adpressed; antennæ somewhat loosely clothed internally.

Head with vertex grooved on each side of middle; occiput with short, transverse, ridgelike granules behind; eyes nearly divided, inferior lobe subtriangular, not very closely approaching base of mandible. Antennæ more strongly spined interiorly, and on more segments, in female than in male. Prothorax weakly swollen at each side before the fine lateral tubercles, constricted before apex. Elytra somewhat uneven, obliquely truncate and spined apically.

Length 35 to 52 millimeters; breadth, 10 to 14.5.

Description based on specimens from Central China and Formosa.

Two examples, in the G. Ros collection and Musée Heude, were taken at Nodoo, altitude 250 meters, west central Hainan, March 25, 1936, by G. Ros.

Distribution.—Central and southern China; Hainan; Formosa.

Genus **DIALEGES** Pascoe

Dialeges PASCOE, Trans. Ent. Soc. London (2) 4 (1856) 46; (3) 3 (1869) 521; LACORDAIRE, Gen. Col. 8 (1869) 263; GAHAN, Fauna Brit. India Col. 1 (1906) 141.

Head with a long neck; frons and vertex with a midlongitudinal groove; eyes deeply emarginate or divided; antennæ one and one-half to two times as long as body in male, slightly longer

than body in female, fringed below with fine hairs in male, fourth segment much shorter than third and fifth segments; prothorax longer than broad, rounded at sides, constricted near apex and base, transversely corrugated; elytra narrow; prosternal intercoxal process vertically truncate posteriorly; hind femora exceeding elytral apices in male; first segment of hind tarsus longer than following two segments united.

Genotype.—*Dialeges pauper* Pascoe.

Range.—Ceylon; Peninsula of southeastern Asia; Hainan; Formosa; Malay Archipelago.

Gahan recorded "three or four examples" of the following species from Hainan, but I have seen no specimens. I quote Gahan's redescription from the Fauna of British India.

DIALEGES UNDULATUS Gahan.

Dialeges undulatus GAHAN, Ann. & Mag. Nat. Hist. (6) 7 (1891) 23, Ceylon, Burma, Siam; *ibid.* (7) 5 (1900) 308, Hainan; Fauna Brit. India Col. 1 (1906) 143, fig. 56; KANO, Trans. Nat. Hist. Soc. Formosa 17 (1927) 52, Formosa.

Pitchy brown, varying on the elytra to reddish brown in the colour of the derm; a covering of greyish pubescence, which is denser and more glossy on the elytra, there also with broad patches or bands of varying shades, like watered silk, according to the incidence of the light. Head slightly elongated behind the eyes; the latter deeply emarginate in front, not divided as they are in the type species. Antennæ of the male twice as long as the body, fringed with hairs under the third and succeeding joints; third joint shorter than the fifth; fifth to seventh subequal; eighth to tenth gradually diminishing in length, and united scarcely longer than the eleventh; antennæ of the female a little longer than the body, with the eleventh joint very little longer than the tenth. Prothorax longer than broad in both sexes, slightly rounded on each side, constricted at the base and apex; transversely and not very strongly wrinkled above, with a line or band bare of pubescence along the middle. Elytra conjointly rounded and unarmed at the apex.

This species, though it has a strong resemblance in shape and coloration to *D. pauper*, Pascoe, the type of the genus, is easily distinguished from it by the following well-marked structural characters:—the head less elongated behind the eyes; the eyes not divided; the third joint of the antennæ shorter than the fifth; the elytra rounded and unarmed at the apex.

Length 16-21; *breadth* 3½-5 mm.—GAHAN, 1906.

Distribution.—Ceylon; Burma; Siam; Hainan; Formosa.

Genus TRACHYLOPHUS Gahan

Trachylophus GAHAN, Ann. & Mag. Nat. Hist. (6) 2 (1888) 59; Fauna Brit. India Col. 1 (1906) 145; LIU, Lingnan Sci. Journ. 12 (1933) 480.

Frons deeply pitted on each side; vertex shallowly grooved between the low antennal supports, carinate between anterior borders of superior eye lobes; occiput deeply grooved between posterior borders of superior eye lobes; antennæ a little longer than body in male, about as long as body in female, third and fourth segments swollen apically, fifth and following segments flattened and angulate externally, fifth segment nearly twice as long as fourth; prothorax slightly broader than long, narrowed apically, rounded laterally, coarsely vermiculate above; elytra long, subparallel, truncate apically; mesosternal process narrow, concave, emarginate apically.

Genotype.—*Trachylophus sinensis* Gahan.

Range.—South China; Burma; Hainan; Formosa; Java.

TRACHYLOPHUS SINENSIS Gahan.

Trachylophus sinensis GAHAN, Ann. & Mag. Nat. Hist. (6) 2 (1888) 60, China; Fauna Brit. India Col. 1 (1906) 146, fig. 58; GRESSITT, Lingnan Sci. Journ. 18 (1939) 14.

Blackish brown, reddish on scape, elytra, thoracic sterna, and bases of abdominal segments; entirely clothed with thin, but close, pale-golden pubescence.

Slender, with ridgelike granules. Antennal scape slender, subcylindrical, nearly as long as third segment, which is one and one-third as long as fourth. Prothorax roughly vermiculate, transversely constricted before apex, with a hexagonal figure, containing a small diamond-shaped one, on middle of disc. Elytra long, truncate apically, microscopically punctulate. Prosternal process produced into a keeled tubercle; metepisternum gradually narrowed posteriorly; first abdominal segment nearly as long as next two together. Femora slender, hind pair reaching only to apex of third abdominal segment; hind tarsi nearly as long as tibiae.

Length, 34 millimeters; breadth, 9.

Description based on a specimen from eastern Kwangtung.

I have seen a single specimen, taken at Sam-a, southern Hainan, April 29, 1936, by G. Ros, and now in his collection.

New to Hainan Island.

Distribution.—South China; Hainan; Formosa; Burma.

Genus RHYTIDODERA White

Rhytidodera WHITE, Cat. Col. Brit. Mus. 7 (1853) 132; THOMSON, Syst. Cer. (1864) 446; PASCOR, Trans. Ent. Soc. London (3) 3 (1869) 524; LACORDAIRE, Gen. Col. 8 (1869) 268; GAHAN, Fauna Brit. India Col. 1 (1906) 146.

Head deeply grooved obliquely behind central diamond-shaped area of frons, narrowly sulcate between antennal insertions; antennæ about as long as body in male, shorter in female, third and fourth segments weakly swollen and somewhat flattened apically, following segments expanded laterally and angulate apically; prothorax as long as broad, constricted and cylindrical apically and basally, narrower at apex, rounded at sides, deeply grooved longitudinally above and at sides in about eighteen rows; elytra long, parallel, narrowed and obliquely truncated apically, with sutural angles produced into small spines; prosternal intercoxal process weakly arched, gradually declivitous posteriorly; mesosternal process plane, narrowed and bifurcated apically.

Genotype.—*Rhytidodera bowringii* White.

Range.—Oriental Region; Korea.

RHYTIDODERA BOWRINGII White.

Rhytidodera bowringii WHITE, Cat. Col. Brit. Mus. 7 (1853) 133, pl. 4, fig. 1, Hongkong; LACORDAIRE, Gen. Col. 8 (1869) 268; DOHRN, Stett. Ent. Zeit. 44 (1893) 156; HEYNE, Exot. Käfer (1903) pl. 33, fig. 5; GRESSITT, Lingnan Sci. Journ. 18 (1939) 15.

Male.—Blackish brown, antennæ, prothoracic grooves, elytra, abdomen, and legs dull reddish brown; body largely clothed with varying pubescence: head thickly clothed on middle of dorsal surface and around eyes, middle of occiput smooth and glabrous, antennæ loosely clothed with tawny hairs on first five segments, prothorax irregularly clothed with tawny hairs, denser and paler beneath, scutellum thickly clothed with yellow-orange pubescence, elytra sparsely clothed with pale, tawny pubescence and marked with five longitudinal rows of narrow, sublinear, fulvous spots, partly arranged in transverse bands, ventral surface and legs clothed with grayish-white pubescence.

Vertex narrowly grooved. Antennæ five-sixths as long as body, flattened apically; scape, and third and fifth segments subequal, longer than fourth and shorter than sixth and following segments. Prothorax longitudinally ridged on disc, transversely grooved and rugose apically and basally. Elytra parallel, narrowly truncate and suturally spined apically. Hind femora reaching to middle of third abdominal segment; first hind tarsal segment nearly as long as following two united.

Length, 32 millimeters; breadth, 7.5.

Two specimens, in the Lingnan Natural History Museum, were taken, 1 at Hoihow, northern Hainan, in 1932 by Prof. W. E. Hoffmann, 1 at Kachek, May 1932, by F. K. To.

New to Hainan.

Distribution.—South China; Hongkong; Hainan.

HESPEROPHANINI

CERASPHORITÆ Veræ Thomson, Syst. Cer. (1864) 248, part.

HESPEROPHANIDES Lacordaire, Gen. Col. 8 (1869) 273.

HESPEROPHANINÆ Pascœ, Trans. Ent. Soc. London (3) 3 (1869) 528.

HESPEROPHANINI Gahan, Fauna Brit. India Col. 1 (1906) 109; Liu, Lingnan Sci. Journ. 12 (1933) 481.

Ligula membranous; eyes large, deeply emarginate, coarsely faceted; antennæ longer than body in male, fringed internally, scape moderately swollen, rounded apically; prothorax generally rounded laterally; elytra parallel; anterior coxal cavities open posteriorly, weakly angulate laterally; middle coxal cavities open exteriorly to epimera; first abdominal segment much shorter than following two segments united.

Key to the Hainan genera of Hesperophanini.

1. Mandibles enlarged and strongly toothed or carinate above in male; a fine, arcuate groove separating frons and clypeus for their entire breadth; antennal supports blunt above; elytra frequently marked with ivory-white spots *Gnatholia*.
- Mandibles small and untoothed above in male; a deep depression in middle of front of head between frons and clypeus; antennal supports acute above; elytra lacking ivory-white spots..... *Stromatium*.

Genus GNATHOLIA Thomson

Gnatholia THOMSON, Classif. Ceramb. (1861) 375; Syst. Ceramb. (1864) 456; LACORDAIRE, Gen. Col. 8 (1869) 284; PASCOE, Trans. Ent. Soc. London (3) 3 (1869) 530; GAHAN, Fauna Brit. India Col. 1 (1906) 110; MATSUSHITA, Journ. Fac. Agr. Hokkaido Imp. Univ. 34 (1933) 294.

Mandibles of male large, deep, strongly toothed or carinate above, projecting anteriorly; genæ subacutely prominent; vertex weakly concave, finely grooved; antennæ one and one-half times as long as body in male, subequal to body in female, third segment nearly twice as long as scape; prothorax transverse, rounded laterally; elytra parallel, rounded or weakly truncate apically, sometimes marked with ivory-white spots; femora laterally compressed, subfusiform.

Genotype.—*Gnatholia eburifera* Thomson.

Range.—India; Peninsula of southeastern Asia; Hainan; Formosa; Philippine Islands; Borneo; Java.

GNATHOLIA EBURIFERA Thomson.

Gnatholia eburifera THOMSON, *Classif. Ceramb.* (1861) 375, Cambodia; GAHAN, *Ann. & Mag. Nat. Hist.* (6) 5 (1890) 53; *Fauna Brit. India Col.* 1 (1906) 111; MATSUSHITA, *Journ. Fac. Agr. Hokkaido Imp. Univ.* 34 (1933) 296.

Male.—Dull reddish brown, elytra each with a pair of narrow, longitudinal, approximate, ivory-white, raised marks at middle, each lying on a weakly raised, light reddish-brown costa extending posteriorly from base. Body clothed with close, gray-brown pubescence and sparse, erect hairs; elytra dotted with glabrous, asperate punctures; antennæ clothed with long, erect hairs internally and ventrally.

Mandibles deep, strongly toothed above; vertex granulose-punctate, finely grooved, a small glabrous concavity between narrow superior eye lobes; occiput granulose, swollen posteriorly. Antennæ one and one-half times as long as body, slender; third segment nearly twice as long as scape, slightly longer than fourth to last segments, which are subequal, third to sixth segments weakly swollen apically. Prothorax broader than long, granulose, with a weak tubercle on either side of midline of disc, just before center. Elytra rounded apically, with a minute tooth at each sutural angle; surface with large, asperate punctures arranged subseriately. Prosternal intercoxal process narrow, weakly arched, not dilated apically; mesosternal process broad; metasternum and abdomen granulose-punctate.

Length 22 millimeters; breadth, 5.5.

A single male specimen, in the Lingnan Natural History Museum, was taken at Loh-fung-tung, Yai District, South Hainan, February 25, 1935, by F. K. To.

New to Hainan.

Distribution.—Tenasserim; Tonkin; Siam; Malacca; Hainan; Formosa; Borneo.

Genus STROMATIUM Serville

Stromatium SERVILLE, *Ann. Soc. Ent. France* 3 (1834) 80; CASTELNAU, *Hist. Nat.* 2 (1840) 452; THOMSON, *Classif. Ceramb.* (1861) 231; *Syst. Ceramb.* (1864) 455; MULSANT, *Col. France Long. ed.* 2 (1862) 129; LACORDAIRE, *Gen. Col.* 8 (1869) 282; LECONTE and HORN, *Classif. Col. N. Amer.* (1883) 287; GAHAN, *Fauna Brit. India Col.* 1 (1906) 114.

Selonophorus MULSANT, *Col. France Long. ed.* 1 (1829) 65.

Apical palpal segment short and compressed; vertex subacutely raised at inner sides of antennal insertions; genæ very short;

antennæ one and one-third as long as body to nearly twice as long in male, subequal to body in female, fringed internally, fourth segment not quite as long as third or fifth; prothorax transverse, rounded laterally, slightly constricted apically and basally, bearing a large, hairy depression on lower part of each side in male, irregular above; elytra subparallel, narrowed and rounded or subtruncate apically, irregular on surface; prosternal intercoxal process weakly arched, slightly broadened preapically; mesosternal process short; metepisternum parallel; femora compressed, hind pair nearly reaching apex of abdomen in male.

Genotype.—*Callidium barbatus* Fabricius.

Range.—Southwestern Palearctic Region; Madagascar; Oriental Region to Batchian, Philippines, and Ryu Kyu Islands; eastern North America; Cuba; South America.

STROMATIUM LONGICORNE (Newman).

Arhopalus longicornis NEWMAN, Entomol. 1 (1842) 246, Manila.

Stromatium longicorne GAHAN, Fauna Brit. India Col. 1 (1906) 115; KATO, Three Color. Illus. Ins. Japan 9 (1933) pl. 18, fig. 2; GRESITT, Lingnan Sci. Journ. 18 (1939) 11.

Stromatium asperulum WHITE, Cat. Col. Brit. Mus. 8 (1855) 300, Hongkong; PASCOE, Trans. Ent. Soc. London (3) 3 (1869) 532.

Male.—Dull reddish brown; mandibles, genæ, and margins of antennal insertions blackish; body clothed with thin gray pubescence, denser tawny hairs around eyes, on frons, anterior and posterior borders of prothorax, and posterior borders of abdominal segments.

Head coarsely granulose-punctate, deeply impressed and glabrous between superior eye lobes. Prothorax transverse; disc coarsely rugulose-punctate, with five swellings forming an M. Elytra narrowed and briefly truncated obliquely with sutural angles finely toothed; surfaces granulose-punctate with large, asperate punctures arranged subseriately in part. Anterior femora strongly flattened and broadened proximally; middle and hind pairs broadest at middle.

Female.—Antennæ as long as body, fourth segment distinctly shorter than third, hardly longer than scape; prothorax lacking cavities.

Length, 14 to 16 millimeters; breadth, 3.75 to 7.8.

Specimens in Lingnan Natural History Museum, from Faan-maan-ts'uen, May 4 to 21, 1932, F. A. McClure; Sam-ah-kong, May 22 to 25, and Taai-chau Island, June 2, 1932, W. E. Hoffmann and O. K. Lau; Kachek, May, Lam-ko, May 23, Lokkel,

June 9 and 21, Nam-fung, June 27, O. K. Lau and F. K. To; Hauying-ts'uen, July 27, 1932, F. K. To; Tai-pin-ts'uen (Dwa-Bi), near Loi Mother Mountain, central Hainan, April 16 to 24, May 13 to 22, Tai-tsing-lam-ts'uen, June 1, 1935, F. K. To; specimens in writer's collection from Nodua, westcentral Hainan, July 10, 1935, collected by the author; Fan-ziang, central Hainan, March 5, 1936, author's native collector; Tai-pin-ts'uen, same data as above; 1 male from Chicheriang, Hainan, July 15, 1904, and 1 female from Mount Wuchi, Five Finger Mountains, May 23, 1903, in the British Museum.

New to Hainan Island.

Distribution.—Assam; Burma; Peninsula of southeastern Asia; Malay Archipelago; Philippines; South China; Hainan; Formosa; Ryu Kyu Islands; Bonin Islands.

CALLIDIOPSINI

CALLIDIOPSIDES Lacordaire, Gen. Col. 8 (1869) 340.

CALLIDIOPSINÆ Pascoe, Trans. Ent. Soc. London (3) 3 (1869) 340.

CALLIDIOPSINI Gahan, Fauna Brit. India Col. 1 (1906) 154; Liu, Lingnan Sci. Journ. 12 (1933) 482.

CALLIDIOPINI Aurivillius, Col. Cat. 39 (1912) 115; Matsushita, Journ. Fac. Agr. Hokkaido Imp. Univ. 34 (1933) 398.

Mandibles flattened, acute; clypeus not distinctly separated from frons; antennal insertions depressed; eyes coarsely faceted, inferior lobes extending anterior to antennal insertions; ligula membranous; apical palpal segments subtriangular; antennæ unarmed; prothorax subcylindrical or transverse; vein Cu_2 of hind wings lacking; anterior coxal cavities closed exteriorly to epimera; femora swollen.

Genus CERESIUM Newman

Ceresium NEWMAN, Entomol. 1 (1842) 322; THOMSON, Syst. Ceramb. (1864) 236; LACORDAIRE, Gen. Col. 8 (1869) 353; PASCOE, Trans. Ent. Soc. London (3) 3 (1869) 536; GAHAN, Fauna Brit. India Col. 1 (1906) 156; MATSUSHITA, Ins. Matsumurana 7 (1932) 66; LIU, Lingnan Sci. Journ. 12 (1933) 482.

Diatomocephala BLANCHARD, Voy. Pole Sud 4 (1853) 266; LACORDAIRE, Gen. Col. 8 (1869) 354.

Pneumida THOMSON, Syst. Ceramb. (1864) 191.

Rhaphidera PERRIS, Ann. Soc. Linn. Lyon (2) 2 (1855) 336.

Rhaphidodera GEMMINGER and HAROLD, Cat. Col. 9 (1873) 2831.

Inferior eye lobes nearly touching mandibles, almost as closely approximate as superior lobes; vertex and occiput not grooved;

antennæ somewhat longer than body in male, subequal to body in female; prothorax cylindrical or weakly swollen at sides; elytra more or less rounded apically; anterior coxæ globose; prosternal intercoxal process narrow; mesosternal process broad, emarginate-truncate apically; femora pedunculate-clavate, much shorter than abdomen; tibiæ noncarinate.

Genotype.—*Ceresium raripilum* Newman.

Range.—Oceania; southern and eastern Asia; Madagascar; Seychelles; Mauritius; Mexico.

Key to the Hainan species of Ceresium.

1. Body black; legs and antennæ reddish; apices of femora black.

geniculatum.

Body reddish brown; prothorax largely clothed with white pubescence.

sinicum.

CERESIMUM GENICULATUM White. Plate 2, fig. 2.

Ceresium geniculatum WHITE, Cat. Col. Brit. Mus. 8 (1855) 245 (East Indies); GAHAN, Fauna Brit. India Col. 1 (1906) 158.

Ceresium rufipes PASCOE, Trans. Ent. Soc. London (3) 3 (1869) 537, Timor.

Male.—Dark brownish black, antennæ, palpi, and legs reddish testaceous, except for black apices of femora; body clothed with pale hairs, scutellum densely pubescent, ventral surfaces somewhat densely clothed, some longer yellowish hairs on basal antennal segments and legs.

Neck reticulately vermiculate posteriorly. Antennæ one and one-fifth as long as body; scape subequal to fifth and following segments, slightly longer than third, which in turn is longer than fourth. Prothorax longer than broad, moderately rounded at sides, grossly vermiculate-punctate above. Elytra conjointly rounded apically, surfaces heavily punctured basally, punctures becoming very fine behind middle. Femora pedunculate basally and strongly swollen in apical three-fourths, clavate portions compressed; first hind tarsal segment as long as following two segments united.

Length, 9.5 to 12 millimeters; breadth, 2.3 to 3.

Two male specimens. in the Musée Heude and Ros collection, were taken at Sam-a, southern Hainan, April 26 and 30, 1936, by Commander G. Ros.

New to Hainan Island.

Distribution.—Burma; Andamans; Siam; Indo-China; Hainan; Flores; Timor.

CERESIMUM SINICUM White.

Ceresium sinicum WHITE, Cat. Col. Brit. Mus. 8 (1855) 245, North China; GAHAN, Ann. & Mag. Nat. Hist. (7) 5 (1900) 348, Hainan; MATSUSHITA, Journ. Fac. Agr. Hokkaido Imp. Univ. 34 (1933) 300; GRESSITT, Lingnan Sci. Journ. 18 (1939) 15.

Dark reddish brown; antennæ reddish testaceous; elytra and legs castaneous; apical abdominal segments partly pale reddish brown. Head and prothorax with fairly dense clothing of tawny hairs on sides of upper parts, and sparsely so on remainder of surfaces; antennæ clothed with thin, tawny pile and suberect hairs on undersides of basal segments; scutellum densely pubescent; elytra with a single oblique hair from each puncture and a few longer erect hairs; metasternum with hairs around margins; abdomen sparsely hairy.

Head sparsely punctured, nearly horizontal between antennal insertions, constricted behind eyes. Antennæ about as long as body; scape subcylindrical, a little longer than third segment; third segment a little longer than fourth and shorter than fifth; fifth to tenth segments decreasing slightly in length. Prothorax one and one-fourth as long as broad, hardly swollen at sides, narrowed apically; surface coarsely punctured, with a median smooth stripe behind middle. Elytra deeply punctured, punctures smaller beyond middle and nearly disappearing before apices.

Length, 13.5 millimeters; breadth, 3.5.

A single specimen, in the British Museum, was collected by Whitehead in 1899, and sent to the author for study by Dr. K. G. Blair.

Distribution.—Central and southern China; Hainan; Formosa; southern Japan.

MOLORCHINI

PSEUDOLEPTURITÆ Thomson, Syst. Ceramb. (1864) 158, part.

MOLORCHIDÆ Lacordaire, Gen. Col. 8 (1869) 482.

NECYDALINÆ Pascoe, Trans. Ent. Soc. London (3) 3 (1869) 565.

STENOPTERI Leconte, Smithsonian Misc. Col. 9 (1873) 306.

MOLORCHINI Gahan, Fauna Brit. India Col. 1 (1906) 169.

Head projecting anteriorly; eyes lateral, finely faceted; antennæ filiform or somewhat serrate apically; prothorax constricted at apex and base, rounded or bluntly tuberculate laterally; elytra generally short or apically narrowed, occasionally entire; anterior coxal cavities briefly angulate externally, gen-

erally closed behind; intercoxal process of mesothorax broad, middle coxal cavities open externally to epimera; first abdominal segment generally long, following segments reduced.

Key to the Hainan genera of Molorchini.

1. Elytra abbreviated, dehiscent and narrowed apically; hind femora suddenly clavate, reaching well beyond apex of abdomen..... *Merionæda*.
Elytra entire, nondehiscent; hind femora gradually clavate, hardly exceeding apex of abdomen *Kunbir*.

Genus MERIONÆDA Pascoe

Merionæda PASCOE, Trans. Ent. Soc. London (2) 4 (1858) 238; *ibid.* (3) 3 (1869) 565, 570; THOMSON, Syst. Ceramb. (1864) 416; LACORDAIRE, Gen. Col. 8 (1869) 400; GAHAN, Fauna Brit. India Col. 1 (1906) 171.

Ocytasia PASCOE, Trans. Ent. Soc. London (3) 3 (1869) 565, 575; HELLER, Ent. Blätter 20 (1924) 31.

Head with a Y-shaped impression in front; eyes deeply emarginate, inferior lobes closely approaching bases of mandibles; antennæ inserted at about level of middle of eyes, shorter than body, scape weakly swollen apically, third and fourth segments slender, following segments flattened and expanded laterally; prothorax constricted anteriorly, swollen laterally; elytra shorter than abdomen, narrowed apically; anterior coxal cavities subtransverse, closed posteriorly; abdomen with first two segments longer in male, first as long as following in female; hind femora long, suddenly and strongly swollen apically; hind tibiæ toothed externally and spined apically.

Genotype.—*Merionæda puella* Pascoe.

Range.—Oriental, Ethiopian, and Neotropical (*Oxycoleus*, *Stenoptrellus*) Regions.

Subgenus OCYTASIA Pascoe

Ocytasia PASCOE, Trans. Ent. Soc. London (3) 3 (1869) 565, 575; HELLER, Ent. Blätter 20 (1924) 31.

Middle tarsi of male strongly expanded laterally, broadly triangular; inner spine of hind tibiæ very long.

Subgenotype.—*Ocytasia fulvipennis* Pascoe.

Range.—Eastern, insular portion of Oriental Region.

MERIONÆDA (OCYTASIA) FORMOSANA ° BURKWALLI Gressitt subsp. nov.

Female.—Yellowish testaceous; prothorax and anterior femora reddish testaceous; head (except palpi), basal antennal segments,

° *Merionæda* (*Ocytasia*) *formosana* HELLER, Ent. Blätter 20 (1924) 32, Formosa.

middle and posterior femoral clubs, and apices of posterior tibiæ black; apical antennal segments, middle tibiæ, and first hind tarsal segments brownish black; hind wing blackish brown. Body nearly glabrous above, sparsely pubescent beneath, with a dense fringe of hairs on posterior margin of second segment, some sparse, oblique hairs on antennæ and legs, and a few long, suberect hairs on first abdominal segment; fifth and following antennal segments with thin, close pubescence.

Head deeply impressed with three converging lines on middle of front; clypeus largely smooth; antennal insertions distant, hardly raised; vertex slightly concave; occiput closely punctured at sides and posteriorly, nearly impunctate in middle; eyes almost divided. Antennæ reaching to apical quarter of elytra; scape weakly arched and slightly swollen apically, longer than any following segment, shiny, subglabrous; third and fourth segments subequal to each other and to ninth and tenth segments, hardly as long as fifth to seventh segments. Prothorax as long as broad, constricted preapically, separating a transverse, impunctate collar; three-fourths as broad at apex as at base; sides moderately swollen and impunctate, a larger, subobliquely oval, impunctate swelling on each side of disc, middle of disc longitudinally swollen, narrowly before middle, basal portion, and depressions between discal swellings finely punctured; basal margin sinuate. Scutellum rounded posteriorly. Elytra gradually narrowed and acuminate apically, strongly dehiscent, nearly straight externally; surfaces deeply punctured subseriately, carinate medially before apices. Metepisterna broad, narrowed apically, deeply and closely punctured, as are sides of metasternum; first abdominal segment nearly impunctate. Anterior and middle femora very weakly swollen, hind pair very slender and subarcuate on basal three-fifths, suddenly and very strongly swollen apically; hind tibiæ weakly sinuate, bearing two rows of small teeth externally and two spines apically, upper spine over twice as long as lower; first hind tarsal segment longer than following two united.

Length, 7.7 to 8.6 millimeters; breadth, 2.

Holotype, female, No. 52177 United States National Museum, No-kyu-chun, central Hainan Island, March 22, 1936, author's native collector; paratype, female, author's collection, Taipin-ts'uen (Dwa-Bi), near Loi Mother Mountain, central Hainan, altitude 275 meters, April 25 and 26, 1935, F. K. To; two additional paratypes in the Lingnan Natural History Museum, Sam-

ts'uen-kai-hui, near Loi Mother Mountain, July 4 to 6, and Tain-pin-ts'uen, April 28 to 30, 1935, F. K. To.

This subspecies differs from *M. formosana* Heller in having the clypeus less punctate, the anterior collar of the prothorax more separated from the midlongitudinal discal swelling, the elytra more evenly narrowed and more sparsely punctured, the hind femora and tibiae more sinuous, the eyes black instead of brownish, the anterior femora reddish testaceous instead of brownish black, and the posterior tibiae black only on apical third. Named in honor of Dr. and Mrs. H. F. Burkwall of the American Presbyterian Mission in Hainan.

Distribution.—Hainan Island.

Genus KUNBIR Lameere

Kunbir LAMEERE, Ann. Soc. ent. Belg. compt. rend. (1890) ccxiii;
GAHAN, Fauna Brit. India Col. 1 (1906) 174.

Head flattened above, with a T-shaped impression on front; eyes distant, closely approaching bases of mandibles, deeply emarginate; antennal insertions distant and improminent; antennae shorter than body in both sexes; prothorax broader at base than at apex, sides feebly swollen; elytra entire, nondehiscent, separately rounded apically; hind tibiae asperate-punctate.

Genotype.—*Kunbir telephoroides* Lameere.

Range.—Central India; Hainan Island.

KUNBIR PALLIDIPENNIS Gressitt sp. nov. Plate 2, fig. 4.

Female.—Pale testaceous, slightly more reddish on head, prothorax, and anterior femora; antennae, clavate portion of middle and hind femora, and tibiae and tarsi, black; somewhat glossy, particularly on center of metasternum and first abdominal segment; elytra and sides of thorax clothed with fine pale pubescence, legs and inner sides of second to fifth antennal segments with suberect hairs.

Head longer than broad, finely punctured; antennae distantly inserted; frons broad, with a median groove meeting a much deeper, transverse groove at its apex; apical palpal segment long, narrow. Antennae fairly slender, extending to apical third of elytra; scape arched and swollen apically; third and following segments subequal in length: fifth segment longest, tenth shortest. Prothorax as broad as long, considerably narrowed apically; disc with a median longitudinal and two lateral rounded swellings; sides with two weak swellings. Scutellum as broad as long, rounded behind. Elytra entire, parallel, separately

rounded apically, finely and somewhat densely punctured in a moderately regular manner over entire surface. Femora moderately swollen, hind pair gradually so, reaching elytral apices; hind tibiae short, feebly arched, asperate; hind tarsi with first segment longer than following two segments combined. Abdomen with first segment longer than remaining segments combined; second segment as long as third and fourth together; second and third segments concave and fringed apically.

Length 8.5 to 11 millimeters; breadth, 2 to 2.5.

Holotype, female, in the British Museum, 99, 315, Hainan Island, 1899, J. Whitehead; paratype, female, in the Lingnan Natural History Museum, Hainan Island, 1932, Prof. W. E. Hoffmann (figure), paratype, female, author's collection, Tai-pints'uen (Dwa-Bi), near Loi Mother Mountain, central Hainan, altitude 325 meters, May 1 to 4, 1935, F. K. To.

This species differs from *K. telephoroides* Lameere, the only previously described species, in being less hairy, in having the hind femora less swollen, and in having the elytra lacking the apical black portion. It was recorded by Gahan as an undescribed species of a new genus allied to *Merionæda*.

Distribution.—Hainan Island.

CALLICHROMINI

CALLICHROMITÆ VERÆ Thomson, Syst. Ceramb. (1864) 170, part.

CALLICHROMIDES Lacordaire, Gen. Col. 9 (1869) 1.

CALLICHROMINÆ Pascoe, Trans. Ent. Soc. London (3) 3 (1869) 582.

CALLICHROMINI Gahan, Fauna Brit. India Col. 1 (1906) 189; Liu, Lingnan Sci. Journ. 12 (1933) 484; Matsushita, Journ. Fac. Agr. Hokkaido Imp. Univ. 34 (1933) 249.

Head generally subacute anteriorly, transversely raised at vertex; clypeus large; eyes finely faceted, deeply emarginate; antennæ generally nearly as long as, to much longer than, body; prothorax generally swollen or tuberculate laterally; scutellum large, triangular; anterior coxal cavities subrounded, generally closed posteriorly; middle coxal cavities open exteriorly to epimera; tibiae, and frequently also tarsi, laterally compressed; male with six visible abdominal segments.

Key to the Hainan genera of Callichromini.

1. First hind tarsal segment as long as, or longer than, following segments combined; hind femora extending well beyond elytral apices; antennæ slender 2.
- First hind tarsal segment shorter than following segments combined; hind femora hardly extending beyond elytral apices..... 3.

2. Antennæ of male at least twice as long as body; first hind tarsal segment subequal in length to remaining segments combined; third antennal segment subequal to fourth..... *Chloridolum*.
Antennæ of male only slightly longer than body; first hind tarsal segment longer than remaining segments combined; third antennal segment longer than fourth *Leontium*.
3. Antennæ thickened apically, barely longer than body in male..... 4.
Antennæ rarely thickened apically, fully as long as body in male, blackish or metallic *Chloridolum*.
4. Antennæ generally unicolorous; dorsal surfaces of body glabrous; prothorax as long as broad..... *Polyzonus*.
Antennæ pale orange apically; dorsal surfaces of body pubescent, densely hairy on pronotum; prothorax broader than long.. *Embrik-Strandia*.

Genus EMBRIK-STRANDIA Plavilstshikov

Embrik-Strandia PLAVILSTSHIKOV, Folia zool.-hydrobiol. 3 (1931) 278.

Head slightly produced below; mandibles forming a prominent angle; antennæ shorter than body in female, shorter than, or as long as, body in male, scape blunt apically, third segment nearly as long as fourth and fifth segments combined, apical segments angular in cross section and slightly produced ectoapically; prothorax rounded-tuberculate laterally, constricted at apex and base; scutellum triangular; elytra gradually narrowed, rounded apically; mesosternal intercoxal process broad, emarginate; hind femora not reaching apices of elytra in female, barely, or not, attaining them in male; first segment of hind tarsus a little longer than following two combined, somewhat compressed laterally.

Genotype.—*Callichroma bimaculatum* White.

Range.—China; Indo-China; Hainan; Formosa.

The following species was described as a *Zonopterus*, but is congeneric with the type of *Embrik-Strandia*, which differs from *Zonopterus* in having the first and third antennal segments unspined ectoapically, the posterior femora longer, the first hind tarsal segment compressed and distinctly longer than the following two segments combined, and in other respects.

EMBRIK-STRANDIA UNIFASCIATA (Ritsema) comb. nov. Plate 1, fig. 11.

Zonopterus unifasciatus RITSEMA, Bull. Mus. Paris 2 (1897) 376, Hue, Annam.

Male.—Purplish black, elytra crossed by a broad, pale-yellow band from about end of first sixth to just behind middle; antennæ with apical seven segments and part of apex of fourth, ochraceous yellow; ventral surface and legs purplish. Body clothed with pubescence corresponding to ground color, except on ab-

domen, where it is somewhat silvery, that on pronotum fairly long and dense.

Frons densely punctured; clypeus more sparsely so; vertex fairly broad, feebly concave, grooved medially; antennæ barely longer than body, fifth and following segments tricarinate and slightly angulated ectoapically, third segment a little shorter than following two segments combined; prothorax broader than long, constricted apically and basally, bluntly tuberculate laterally, its surface rugulose, but largely hidden by pubescence; scutellum narrowly triangular, concave; elytra conjointly rounded apically, micropunctulate; metepisternum densely punctured; femora more grossly punctured; first hind tarsal segment one and one-half times as long as following two segments united.

Length, 18 millimeters; breadth, 5.3.

Female.—Antennæ not quite as long as body.

Length, 26 to 29 millimeters; breadth, 8.5.

Nine specimens, in the Lingnan Natural History Museum and in the author's collection, were taken at Ting-on, northeastern Hainan, April 21 and 22, 1932, and at Kachek, eastern Hainan, May 3 to 6, 1932, by Prof. W. E. Hoffmann; Nam-fung, west-central Hainan, July 2, 1932, Tai-pin-ts'uen (Dwa-Bi), central Hainan, May 29 to 31, 1935, F. K. To; and Maan-fook-ts'uen, Hainan, July 4 to 19, 1929, Lingnan Univ. Fifth Hainan Exped.

New to Hainan.

Distribution.—Indo-China (Annam); Hainan Island.

Genus POLYZONUS Castelnau

Polyzonus CASTELNAU, Hist. Nat. Col. 2 (1840) 438; LACORDAIRE, Gen. Col. 9 (1869) 21; GAHAN, Fauna Brit. India Col. 1 (1906) 213.

Slender; head produced anteriorly almost into a beak; antennæ about as long as body, thickened, but feebly toothed apically; third segment much longer than scape; prothorax briefly tuberculate on each side of middle; scutellum triangular, concave; elytra long, subparallel, rounded apically; posterior femora reaching to about elytral apices; first hind tarsal segment a little longer than following two segments combined.

Genotype.—*Saperda fasciata* Fabricius.

Range.—Oriental Region.

POLYZONUS PRASINUS (White).

Promeces prasinus WHITE, Cat. Col. Brit. Mus. 7 (1853) 170.

Chelidonium polyzonoides THOMSON, Syst. Cer. (1865) 568.

Polyzonus prasinus GAHAN, Fauna Brit. India Col. 1 (1906) 219.

Female.—Body green with golden-green tinges, particularly on head, sides, and a precentral spot on disc, of prothorax, and on scutellum; elytra slightly tinged with bluish; antennæ and legs steel-blue with lavender tints, the former blackish violet distally. Elytra with purplish, and ventral surfaces with silvery, pubescence.

Head narrower than prothorax, much longer than broad, deeply vermiculate-punctate on clypeus and vertically ridged on frons; occiput grooved and rugose-punctate. Antennæ almost as long as body, thickened and somewhat silvery towards apices. Prothorax as long as broad, obtusely tuberculate, granulose-punctate on disc and vermiculate at sides. Elytra finely punctulate. Posterior femora not quite reaching to elytral apices; first hind tarsal segment a little longer than following two segments united.

Length, 25 millimeters; breadth, 4.2.

One specimen, British Museum 1911-288, was taken at Youboi, Hainan, June 4, 1904.

New to Hainan Island.

Distribution.—Southern India; Assam; Hainan.

Genus CHLORIDOLUM Thomson

Chloridolum THOMSON, Syst. Cer. (1864) 174; LACORDAIRE, Gen. Col. 9 (1869) 18; GAHAN, Fauna Brit. India Col. 1 (1906) 210.

Antennæ fully twice as long as body in male, slightly longer in female, slender, not strongly toothed externally; scape more or less acute ectoapically; prothorax sharply toothed laterally; scutellum triangular; elytra long, narrowed posteriorly; posterior femora reaching beyond elytral apices; posterior tibiæ compressed; first segment of posterior tarsi compressed, as long as remaining segments united.

Genotype.—*Callichroma bivittatum* White.

Range.—Oriental region, extended to North China, Japan and Australia.

CHLORIDOLUM LOOCHOOANUM HAINANICUM Gressitt subsp. nov. Plate 1, fig. 6.

Male.—Frosted green, shiny green on head, scutellum, ventral surfaces, parts of prothorax, extreme bases of elytra, and basal half of elytral suture; antennæ and legs purplish violet; scape bluish; anterior femora somewhat greenish; pronotal disc tinged with blue; antennal condyles, labrum, apical portion of clypeus, and apices of palpi reddish testaceous; eyes black. Ventral surface of body clothed with thin, silvery pubescence; under-

sides of basal antennal segments and inner sides of middle and hind tibiae clothed with brief, black bristles.

Head no wider than base of prothorax, vermiculate-punctate on occiput, longitudinally carinate between upper eye lobes, longitudinally sculptured and punctured on frons, punctured on clypeus and genæ, longitudinally polycarinate below eyes and transversely so on gular region; vertex feebly concave; frons squarish, medially grooved; inferior eye lobes broader than deep. Antennæ one and three-fourths as long as body, first seven segments slightly thickened at apices; scape grossly punctured, three-fifths as long as third segment; fourth segment slightly shorter than, and fifth barely longer than, third; last segment longest. Prothorax as broad as long, broadly, but subacutely tuberculate laterally; surface in large part transversely vermiculose, middle of disc granulose, sides below lateral tubercles smooth. Scutellum rounded-concave and smooth. Elytra gradually narrowed, finely subreticulate-punctate, vermiculate-punctate along suture. Ventral surface micropunctulate. Posterior tibiae feebly sinuate. First segment of hind tarsus longer than following segments combined.

Length, 18 millimeters; breadth, 4.1.

Holotype, male, in the Lingnan Natural History Museum, Naam-po, Hainan Island, May 28, 1932, F. K. To; two male paratypes in the British Museum and in the author's collection, You-boi, Hainan, June 4, 1904 (British Museum 1911-288).

Differs from *C. loochooanum* Gressitt (23, p. 163) in being more green and less blue, in having the frons more sculptured, the vertex more vermiculate, the antennæ relatively shorter, the prothorax less acutely tuberculate and more extensively vermiculate, the scutellum shorter and smoother, the elytra more sculptured along suture, and in other respects. Differs from *C. loochooanum taiwanum* Gressitt in having the prothorax greener and less completely vermiculated, the vertex less concave, the antennæ shorter, and in other characters.

Distribution.—Hainan Island.

Genus LEONTIUM Thomson

Leontium THOMSON, Syst. Cer. (1864) 175, 420; GAHAN, Fauna Brit. India Col. 1 (1906) 211.

Antennæ only slightly longer than body in both sexes; scape hardly grooved; fourth segment distinctly shorter than third; sixth to tenth segments briefly toothed ectoapically; prothorax

longer than broad, finely tuberculate laterally; elytra subparallel; posterior femora straight and slender, exceeding abdomen.

Genotype.—*Leontium viride* Thomson.

Range.—Eastern Oriental Region; North China; Japan.

LEONTIUM NIGROSCUTELLATUM Gressitt sp. nov. Plate 1, fig. 10.

Female.—Elongate, slightly narrowed posteriorly, antennæ and legs fairly thick, elytra strongly rugulose basally. Shiny green, appendages bluish; head blue-green anteriorly and laterally, dull green on occiput; palpi blackish; antennæ purple-blue on scape, violet-blue on following segments, blackish apically; prothorax dull green above, bright blue-green at sides; scutellum greenish black; elytra bright green; ventral surfaces frosted green with fine silvery pubescence; legs with femora greenish basally and blue on remainder, tibiæ and tarsi violet-blue, the latter blackish on last three segments.

Head but slightly prolonged anteriorly; with moderately fine punctures; occiput with a central impunctate area; superior interocular area with longitudinal grooves and ridges; vertex slightly concave; frons constricted at middle, grooved longitudinally at sides and transversely at apex. Antennæ somewhat thickened posteriorly, one and one-seventh as long as body; all segments but second and last slightly expanded externally at apices, sixth to tenth segments subacutely produced; scape heavily punctured, one-half as long as third; fourth segment shorter than fifth and sixth. Prothorax longer than broad at base, quite strongly tuberculate just behind middle of side, an obtuse swelling between anterior margin and tubercle; surface transversely striated near anterior and posterior margins, densely and irregularly vermiculated on disc. Scutellum longer than broad, rounded apically, broadly grooved longitudinally, smooth except at sides. Elytra grossly rugulose-punctate on basal third, densely and finely punctate on remainder; apices narrowed and obtusely angulate at suture, not reaching apex of abdomen. Legs with femora rather strongly thickened apically, second pair arched, third pair nearly straight; hind tibiæ fairly straight, broadened and compressed apically; hind tarsi with first segment longer than remaining segments combined.

Length, 17 to 18 millimeters; breadth, 3.2 to 3.6.

Holotype, female, in the Musée Heude, Shanghai, Shuiman, Hainan Island, April 17, 1936, G. Ros; paratopotype, female, Ros collection, same data.

Differs from *L. punctulatum* Pic in being larger, in having the pronotum with transverse ridges and grooves anteriorly and basally, and the disc vermiculose instead of punctate, elytra very deeply impressed basally, prothorax and scutellum duller, and antennæ violaceous instead of cyaneous. Differs from *L. viride* Thoms. in its larger and heavier form, more abruptly swollen hind femora, vermiculose pronotal disc, and duller coloration. *L. tenuipes* Fairm. differs from the new form in having the occiput transversely sulcate, the pronotal disc striated longitudinally in middle and transversely at sides, the scutellum acute and rough, and the elytra finely rugulose.

Distribution.—Hainan Island.

Genus CHELIDONIUM Thomson

Chelidonium THOMSON, Syst. Cer. (1864) 175, 420; GAHAN, Fauna Brit. India Col. 1 (1906) 210.

Leontium LACORDAIRE, (nec Thomson), Gen. Col. 9 (1869) 19; PASCOE, Trans. Ent. Soc. London (3) 3 (1869) 595.

Antennæ a little longer than body in male, subequal in body length to female, fifth to tenth segments angulate externally at apices; prothorax short, tuberculate laterally; elytra gradually narrowed and rounded apically; hind femora reaching or exceeding elytral apices; first hind tarsal segment longer than following two segments united. Generally frosted green or blue.

Genotype.—*Cerambyx argentatum* Dalman.

Range.—Oriental Region, north to eastern Siberia and Japan.

Key to the Hainan species of *Chelidonium*.

- Prothorax rugulose-punctate; ectoapical angles of fifth and following antennal segments strongly spined; first hind tarsal segment distinctly shorter than remaining segments united..... *argentatum*.
 Prothorax entirely striate, largely in a transverse direction; fifth and following antennal segments sharply angulate, instead of spined, ectoapically; first hind tarsal segment as long as remaining segments combined *gibbicolle*.

CHELIDONIUM ARGENTATUM (Dalman). Plate 1, fig. 9.

Cerambyx argentatum DALMAN in Schönherr, Syn. Ins. (1817) app. 151.

Chelidonium argentatum GAHAN, Fauna Brit. India Col. 1 (1906) 211; GRESSITT, Lingnan Sci. Journ. 18 (1939) 26.

Male.—Frosted green; prothorax and top of head bluish; antennæ, tibiæ, and tarsi blackish purple or violet; ventral surfaces of body clothed with silvery pubescence.

Moderately large, parallel, plane above; head attenuated anteriorly, mandibles long, frons impunctate in middle; remainder of head deeply punctured, except narrowly in middle of occiput; antennæ barely reaching beyond elytral apices, fifth to tenth segments sharply spined externally at apices, scape heavily punctured, one-half as long as third segment, fourth segment two-thirds as long as third segment, slightly shorter than fifth and following segments. Prothorax as broad as long, subrectangular, bluntly tuberculate behind middle of each side, its surface reticulate-punctate and subtransversely vermiculate; scutellum acutely elongate-triangular, smooth; elytra long, nearly parallel, conjointly rounded apically, their surfaces finely vermiculate-punctate; femora weakly swollen; tibiæ strongly flattened; first hind tarsal segment shorter than remaining segments combined.

Length, 23.5 millimeters; breadth, 5.2.

Four specimens, in the Lingnan Natural History Museum and in the author's collection, were taken at Lung-hou and Lung-tong, 31 miles south of Ting-on, Hainan, April 21 and 22, 1932, by Prof. W. E. Hoffmann and O. K. Lau; 1 male was taken at "The Hummocks", northern Hainan, May 24, 1936, by G. Ros, and is in his collection.

New to Hainan.

Distribution.—South China; Hainan; Burma; Assam; southern India.

CHELIDONIUM GIBBICOLLE (White).

Callichroma gibbicolle WHITE, Cat. Col. Brit. Mus. 8 (1853) 160, "N. China".

Chelidonium gibbicolle GAHAN, Fauna Brit. India Col. 1 (1906) 213, fig. 80; GRESSITT, Lingnan Sci. Journ. 18 (1939) 26.

Male.—Dark green, head, prothorax, and scutellum somewhat shiny; elytra rather dull except near base and along suture; scape and anterior and middle femora greenish; following antennal segments and posterior femora greenish violet; apical portion of antennæ black; tibiæ and tarsi purplish violet; ventral surface of thorax golden-green, that of abdomen greenish brown, all clothed with thin, silvery-white pubescence.

Head finely punctured, partly rugulose; occiput smooth in middle. Antennæ one and one-fifth as long as body, subacutely spined; scape densely punctured, subangulate ectoapically, one-half as long as third segment and three-fourths as long as fourth segment; fourth to tenth segments subequal in length. Prothorax broader than long, obtusely tuberculate laterally; dorsal surface almost entirely plicate in a transverse direction; disc

with a raised swelling on each side near base. Scutellum narrowly triangular, smooth and concave. Elytra finely vermiculate-punctulate, more coarsely so near suture and base. Fifth and sixth abdominal sternites moderately emarginate apically.

Length, 24 millimeters; breadth, 6.

A single male, in the Lingnan Natural History Museum, was collected on Hainan Island, April 28 and 29, 1932, by Prof. W. E. Hoffmann.

New to Hainan.

Distribution.—South China; Formosa; Hainan; Assam; Sylhet.

COMPSOCERINI

COMPSOCERITÆ Thomson, Syst. Cer. (1864) 260.

COMPSOCERIDES Lacordaire, Gen. Col. 9 (1869) 30.

ROSALINÆ J. Leconte, Smiths. Misc. Coll. (9) 265 (1873) 310.

ROSALINI Gahan, Fauna Brit. India Col. 1 (1906) 175.

COMPSOCERINI Aurivillius, Col. Cat. 39 (1912) 326.

Head projecting forward; antennal tubercles emarginate above; apical palpal segments slightly broadened, truncate, antennæ longer than body in male, often plumed or toothed; prothorax generally unarmed; scutellum short; elytra long, parallel; anterior coxæ globular; middle coxal cavities open externally to epimera.

Genus ROSALIA Serville

Rosalia SERVILLE, Ann. Soc. ent. France 2 (1833) 561; LACORDAIRE, Gen. Col. 9 (1869) 33; LAMEERE, Ann. Soc. ent. Belg. 31 (1887) 171; GAHAN, Fauna Brit. India Col. 1 (1906) 176.

Frons swollen in middle; vertex raised, feebly concave; eyes finely faceted; antennæ long in male, third and fourth segments subequal, third to fifth segments thickened, and spined internally, at apices, frequently tufted; prothorax transverse, swollen laterally; elytra subparallel, obliquely rounded apically; femora swollen beyond middle, hind pair not reaching elytral apices; anterior coxal cavities broad and open behind; metepisterna strongly narrowed posteriorly.

Genotype.—*Cerambyx alpinus* Linnæus.

Range.—Palearctic, Oriental, and western Nearctic Regions.

Subgenus EURYBATUS Thomson

Eurybatus THOMSON, Classif. Cer. (1860) 250; LACORDAIRE, Gen. Col. 9 (1869) 32.

Pubescence clothing body largely vermilion, marked with spots or bands of black; antennæ generally with rather feeble tufts of hair; mandibles of male lacking dorsal tooth.

Subgenotype.—*Lamia lateritia* Hope.

Range.—Oriental Region.

ROSALIA (EURYBATUS) DECEMPUNCTATA (Westwood).

Purpuricenus decempunctatus WESTWOOD, Cab. Orient. Ent. (1848) 59, pl. 29, fig. 2, Assam.

Eurybatus 10-punctatus GAHAN, Ann. & Mag. Nat. Hist. (7) 5 (1900) 348, Hainan.

Rosalia decempunctata GAHAN, Fauna Brit. India Col. 1 (1906) 179.

Body beneath, except the prosternum, black; the prosternum red, with the intercoxal part and a triangular spot on each side black; head black, sometimes with two red spots above; pronotum and elytra red, the first with four, or sometimes only three, and the latter with a variable number of black spots. Antennæ of male extend by their last three joints beyond the apex of the elytra; first joint sparsely punctate; third slightly longer than fourth; third to fifth each with a blunt spine almost at right angles from the apex, the spine on the third strongest; antennæ of female shorter than the body, joints third to fifth dilated, densely pubescent and subspinose at the apex. Prothorax globose at the sides in both sexes; the disc with a tubercle on each side in the female, without it in the male; marked with four black spots, two median and two lateral, the anterior median spot sometimes absent. Elytra each with from two to five black spots—two dorsally placed, one at the middle and the other midway between it and the base, one small lateral spot at about one-fifth from the base, one dorsal-lateral between the middle and apex; in addition to these there is sometimes a small black spot at the base close to the scutellum; the median dorsal spot is generally present, but any or all of the other spots are liable to disappear. Femora subclavately thickened below the middle, sparsely punctulate and more or less nitid. Intercoxal processes of pro- and meso-sterna narrow. Length, 20–35 millimeters.

GAHAN, 1906, description of Himalayan material.

Distribution.—Sikkim; Assam; Hainan; Borneo; Java.

CLYTINI

CLYTIDES Mulsant, Col. France Long. (1839) 70; Lacordaire, Gen. Col. 9 (1869) 57.

CLYTITÆ Thomson, Classif. Cer. (1860) 214; Syst. Cer. (1864) 184.

ANAGLYPTIDES Lacordaire, Gen. Col. 9 (1869) 84.

CLYTINÆ Pascoe, Trans. Ent. Soc. London (3) 3 (1869) 597.

CLYTINI Gahan, Fauna Brit. India Col. 1 (1906) 239.

Head short, more or less vertical in front; antennæ generally shorter than body; prothorax globular or oval; elytra often slightly narrowed and truncate apically; hind legs generally long; anterior coxal cavities weakly angulate externally, open behind; middle coxal cavities open to epimera; tarsal claws divaricate.

Key to the Hainan genera of Clytini.

1. Antennæ more or less distantly inserted on head, intervening space fairly even 2.
 Antennæ rather closely inserted, space between insertions elevated near each side, concave in middle 3.
2. Head carinate anteriorly *Xylotrechus*.
 Head not carinate anteriorly *Perissus*.
3. First hind tarsal segment much longer than remaining segments combined 4.
 First hind tarsal segment very little, or not, longer than remaining segments combined 5.
4. Antennæ with third and fourth segments spined apically..... *Demonax*.
 Antennal segments not spined, some with small tufts of hairs apically. *Sclethrus*.
5. Antennæ very slender, third segment longer than scape..... *Rhaphuma*.
 Antennæ not very slender, third segment no longer than scape. *Chlorophorus*.

Genus XYLOTRECHUS Chevrolat

Xylotrechus CHEVROLAT, Ann. Soc. Ent. France (1860) 456; THOMSON, Syst. Cer. (1864) 424; LACORDAIRE, Gen. Col. 9 (1869) 77; GAHAN, Fauna Brit. India Col. 1 (1906) 241.
Amauresthes CHEVROLAT, Mem. Soc. R. Sci. Liege 18 (1863) 327, part.

Moderately broad; slightly narrowed posteriorly. Frons vertical, bearing one or more longitudinal, or converging, carinae along middle; antennæ distantly inserted, short; prothorax subglobose; scutellum short; elytra generally bisinuate-truncate apically; mesosternal intercoxal process broad, subemarginate; metepisternum broad; hind femora generally exceeding elytra in male; first hind tarsal segment at least twice as long as following two segments combined.

Genotype.—*Xylotrechus sartorii* Chevrolat.

Range.—Palæarctic, Oriental, Nearctic, Ethiopian, and northern Indo-Australian Regions.

Key to the Hainan species of *Xylotrechus*.

1. Derm at elytral bases partly orange or castaneous; bands greenish or grayish; frons distinctly carinate..... 2.
 Derm at elytral bases entirely black; bands of sulphury pubescence; frons not distinctly carinate..... *nigrosulphureus*.
2. Prothorax black, or partly clothed with gray or greenish pubescence, less than two-fifths as long as elytra; elytra with a subbasal oblique stripe or else lacking a distinct basal band..... 3.
 Prothorax red, or sometimes black, two-fifths as long, and fully as broad, as elytra; elytra with three yellow bands, the first basal and joined with second along suture..... *magnicollis*.

3. Pubescence on dorsal surfaces greenish; elytra with a transverse band at extreme base and a prominent, free, oblique stripe on each side behind base *quadripes*.
 Pubescence on dorsal surfaces grayish; elytra chestnut brown near scutellum, lacking distinct basal bands or longitudinally oblique stripes. *basalis*.

XYLOTRECHUS BASALIS Schwarzer.

Xylotrechus basalis SCHWARZER, Ent. Blätter 21 (1925) 25, Formosa;
 MATSUSHITA, Journ. Fac. Agr. Hokkaido Imp. Univ. 34 (1933) 267,
 268.

Male.—Elongate, subparallel. Body dark reddish brown, largely black on head, antennæ, and prothorax, and marked on elytra with bands of brownish testaceous, forming background of most of pale pubescent markings of latter. Surfaces clothed with pale gray and grayish tawny pubescence, as follows: head, antennæ, and prothorax thinly clothed with gray except on intercarinal area of frons, on neck, and on three round pronotal spots forming an inverted triangle; scutellum clothed with pale buff; each elytron blackish, marked with grayish tawny as follows: (a) a transverse basal band, not reaching humerus; (b) a transverse, free, discal band at end of basal fifth; (c) a stripe commencing behind scutellum, extending along suture to middle, then broadened, and directed transversely and anteriorly to external margin; (d) a transverse band just before apical third, broadest at suture; and (e) an oblique apical area; ventral surfaces with grayish-white pubescence except on metasternum and bases of abdominal segments.

Head with a large Y-shaped carina on frons, and a smaller, inverted, Y-shaped carina on occiput. Antennæ reaching slightly beyond humeri, somewhat broadened and flattened apically. Prothorax granulose, broadest behind middle. Elytra transversely truncate apically, toothed externally.

Length, 13.6 millimeters; breadth, 3.7.

A single specimen, in the Lingnan Natural History Museum, was taken at Sam-kwong-ts'uen, Lam-wan-tung, Kiung-shan District, August 7 to 9, 1935, by F. K. To.

New to Hainan.

Distribution.—Formosa; Hainan.

XYLOTRECHUS MAGNICOLLIS Fairmaire.

Xylotrechus magnicollis FAIRMAIRE, Ann. Soc. Ent. Belg. 32 (1888)
 34, China; MATSUSHITA, Journ. Fac. Agr. Hokkaido Imp. Univ.
 34 (1933) 371, Formosa.

Female.—Body black; prothorax red above and at sides except narrowly along anterior border; elytra with three transverse, testaceous bands clothed with pale-yellow pubescence, first band along basal margins, quite narrow and not reaching humeri, connected with second band by a narrow band along each side of suture, second transverse behind and obtuse in front, third slightly obtuse before and behind at suture and broadened at external margins, continuing posteriorly almost to external angles; ventral surfaces largely clothed with creamy-yellow pubescence; posterior tibiae slightly reddish brown.

Head with a pair of carinae on frons which approach each other and become diffused below; antennae about one-half as long as body, moderately slender, not thickened distally; prothorax large, nearly as long as broad, as wide as elytral bases, subtransversely corrugated on center, and punctured on periphery, of disc; elytra short, strongly narrowed and transversely truncate; posterior femora extending beyond elytral apices.

Length, 11 millimeters; breadth, 3.7.

A single female, in the Lingnan Natural History Museum, was taken northwest of Nodoa, August 27, 1929, by the Lingnan University Fifth Hainan Island Expedition.

New to Hainan.

Distribution.—Formosa; South China; Hainan.

XYLOTRECHUS NIGROSULPHUREUS Gressitt sp. nov. Plate 2, fig. 9.

Male.—Stout, subcylindrical, slightly narrowed posteriorly. Body black, somewhat reddish brown at apices of antennae, on coxae, basal portions of femora, and apical portions of abdominal segments. Surfaces in part clothed with sulphur-yellow pubescence of various intensities, and to a slight extent with white pubescence, as follows; head with sparse, oblique, deep sulphur-yellow hairs, densest along each side of frons; antennae with sparse, subrecumbent, yellowish to dirty-white hairs on first four segments, and with thin, silvery-gray pubescence on remainder; prothorax clothed with moderately dense, dark, sulphur-yellow pubescence, except along central portions of pronotum, and three small subglabrous spots on each side, two before middle and one near base, posteriolateral margin narrowly clothed with white; scutellum densely sulphur-yellow; each elytron clothed with dense sulphur-yellow as follows: (a) on base, near scutellum; (b) on sides of humerus and lateral declivity to end of first quarter; (c) entire suture and external margin, narrowly; (d) a stripe commencing immediately behind scutellum, extend-

ing along suture to end of basal third, then curving outward and extending almost transversely to external margin; (e) a transverse band from suture to external margin, just before end of second third; and (f) apical fifth less densely clothed; a few scattered yellowish-white hairs on disc near base; ventral surfaces clothed with paler sulphur-yellow pubescence, whitish on thoracic pleura and coxæ; legs with scattered yellowish or whitish hairs.

Head obsoletely carinate and coarsely punctured on frons, rugulose on occiput. Antennæ slightly over one-half as long as body; scape punctulate, barely longer than third segment; fifth segment a little longer than fourth and subequal to third. Prothorax evenly rounded laterally, coarsely reticulate-punctate. Elytra slightly narrowed, truncate apically; surfaces subvermiculate-rugose on basal two-thirds, finely punctured and feebly vermiculose apically. Posterior femora exceeding elytral apices; first segment of posterior tarsus longer than remaining segments combined.

Holotype, length 14 millimeters; breadth, 4.

Paratype, length, 12 millimeters; breadth, 3.7.

Female.—Antennæ not quite one-half as long as body.

Length, 12.5 millimeters; breadth, 3.7.

Holotype, male, no. 52170 United States National Museum, Dwa-Bi (Tai-pin-ts'uen), near Loi Mother Mountain, central Hainan, altitude 350 meters, July 29, 1935, collected by the author; allotype, female, author's collection, July 26; two male paratypes, Lingnan Natural History Museum, Sam-kwong-ts'uen, Lam-wan-tung, Kiung-shan District, August 16 to 18, 1935, F. K. To.

Differs from *Clytus robusticollis* Pic, with which it is congeneric, in being more cylindrical, and in having the prothorax more extensively clothed with pubescence and less coarsely reticulate, the elytra less rounded apically and with broader and more sulphury bands, the ventral surfaces almost entirely yellow, and in other respects. Though the frons is not very distinctly carinate, this species is better placed here than in *Clytus*.

XYLOTRECHUS QUADRIPIES Chevrolat.

Xylotrechus quadripes CHEVROLAT, Mem. Soc. R. Sci. Liege 18 (1863) 315 (63); GAHAN, Ann. & Mag. Nat. Hist. (7) 5 (1900) 348, Hainan; Fauna Brit. India Col. 1 (1906) 245, fig. 90; MAXWELL-LFREY, Indian Ins. Life (1909) 374, fig. 254.

Xylotrechus coffeophagus RICHTER, Proc. Agr.-Hort. Soc. Madras (1867).

Body black, tinged with reddish brown on antennæ, legs, and parts of elytral markings. Surfaces clothed with greenish and pale-yellow pubescence as follows: head and prothorax with thin greenish pubescence, paler on lower parts, pronotum with three black spots in a transverse row; scutellum with dense yellowish-white pubescence, elytra with an orange spot at base of each, pubescence arranged on each elytron as follows: (a) a transverse band at base; followed by (b) a longitudinally oblique free stripe on disc; (c) a transverse band slightly before middle, which continues forward along suture to a point just behind scutellum; (d) a transversely oblique band behind middle, broadest at suture; and (e) the apex broadly pubescent.

Head hardly broader than anterior margin of prothorax, with a long, narrow, median carina and a shorter carina on each side of frons; occiput rugulose. Antennæ about one-half as long as body; third and fourth segments equal, barely as long as fifth segment. Prothorax broader than long, widest behind middle, finely rugose. Elytra gradually narrowed, sinuate-truncate apically.

Length, 16 millimeters; breadth, 4.6.

One specimen was taken near Fooi-iu, August 26, 1929, Lingnan Univ. Fifth Hainan Exp. A slightly atypical specimen of this species was recorded from Hainan by Gahan.

Distribution.—Burma; Siam; Tonkin; Hainan; Formosa; East Indies.

Genus PERISSUS Chevrolat

Perissus CHEVROLAT, Mem. Soc. R. Sci. Liege 18 (1863) 262 (10); LACORDAIRE, Gen. Col. 9 (1869) 79; PASCOE, Trans. Ent. Soc. London (3) 3 (1869) 615; GAHAN, Fauna Brit. India Col. 1 (1906) 254.

Head broad, with antennal insertions widely separated, vertex plane, eyes narrowly emarginate; antennæ more than one-half as long as body in male, less than one-half as long as body in female, segments lacking spines and subequal in length; prothorax generally a little longer than broad, more or less swollen at sides; elytra subtruncate apically; legs long, particularly posterior pair; posterior tarsi about as long as respective tibiæ, first segment longer than remaining segments combined.

Genotype.—*Perissus x-littera* Chevrolat.

Range.—Oriental and southern Palearctic Regions; Austro-Malayan Subregion.

Key to the Hainan species of Perissus.

Prothorax evenly rounded laterally, lacking a transverse black spot on disc; elytra with second fascia evenly curved to external margin, third fascia not very suddenly broadened at suture, apices narrowly and obliquely truncate, not distinctly toothed; form of body cylindrical and parallel-sided..... *indistinctus*.

Prothorax broadest near base, a transverse black spot on disc; elytra with second fascia recurved posteriorly near external margin, third fascia greatly broadened at suture, apices broadly and transversely truncate, with a distinct tooth; body narrowed posteriorly.

kankauensis chungkonensis.

PERISSUS INDISTINCTUS Gressitt sp. nov.

Male.—Subcylindrical. Body brownish black, somewhat reddish brown on antennæ, tarsi, coxæ, and bases of femora. Surfaces in part clothed with grayish-white pubescence: thinly over most of head and prothorax, densely on upper sides of middle antennal segments, on scutellum, and on each elytron as follows: (a) a narrow basal band, rather indistinct on humerus; (b) a moderately narrow stripe commencing at suture just behind scutellum curving gradually outward to end of basal third on middle of disc, and slightly forward to external margin; (c) a subtransverse band a little behind middle, broadest at suture and curved slightly backward near external margin; and (d) an obliquely margined apical area; ventral surfaces rather densely clothed at sides of thorax and first two abdominal segments, thinly on remainder and on legs.

Head narrower than prothorax, plane and finely granulose in front. Antennæ three-fifths as long as body, broadened and flattened beyond fourth segment; scape longer than third segment; fourth segment equal to third and shorter than fifth. Prothorax barely longer than broad, evenly rounded at sides, coarsely granulose on disc. Elytra narrowed and obliquely truncate apically. Posterior femora slightly exceeding elytral apices.

Holotype, length 8.5 millimeters; breadth, 2.4.

Paratype, length, 6.7 millimeters; breadth, 1.75.

Holotype, male, in the Lingnan Natural History Museum, Samkwong-ts'uen, Lam-wan-tung (Loi territory), Kiung-shan District, Hainan, August 7 to 9, 1935, F. K. To; paratype, in the author's collection, Nam-liu-tin, Lam-wan-tung, Kiung-shan District, August 3 and 4, 1935, F. K. To.

Differs from *P. kankauensis* Schwarzer in being slenderer, with the antennæ more flattened, the pronotum more sparsely granulose, the subbasal arcuate stripe of elytra broader and not

turned posteriorly near external margin, the elytral apices less transverse and less strongly toothed, and in other characters.

Distribution.—Hainan Island.

PERISSUS KANKAUENSIS CHUNGKONENSIS Gressitt subsp. nov. Plate 2, fig. 7.

Male.—Broad, abbreviated, slightly narrowed posteriorly. Body blackish brown, somewhat reddish brown on antennæ, ventral surfaces, tibiæ, tarsi, bases of femora, genæ, and sides of vertex and occiput. Surfaces in part clothed with grayish or white pubescence as follows: thinly grayish white on frons, antennæ, and scutellum, duller grayish on occiput and vertex, white on genæ and lower parts of prothorax; elytra marked each with whitish gray as follows: (a) a basal band joined to a humeral area; (b) a narrow stripe commencing behind basal band, extending along suture a short distance, curving outward to near middle of disc at end of basal two-fifths, there bending forward to just behind humeral mark; thence extending obliquely backward to margin; (c) a subtransverse band just behind middle, broad at suture, greatly narrowed and curved slightly backward in crossing disc to external margin; and (d) the apical sixth similarly pubescent; ventral surfaces moderately clothed with silvery-white pubescence, sparser along middle of sternites and lacking on mesepimeron and posterior end of metepisternum; legs with sparse, oblique, pale hairs.

Head broad, finely rugulose-punctate; frons convex. Antennæ nearly two-thirds as long as body; scape subequal in length to third, fourth, and fifth segments, respectively. Prothorax barely longer than broad, swollen behind middle at each side and on disc; surfaces finely granulose-punctate, coarsely granulose along median portion of disc. Elytra short, narrowly and obliquely truncate apically with external angles toothed. Posterior femora extending much beyond elytral apices; first hind tarsal segment nearly one and one-half times as long as remaining segments combined.

Holotype, length, 11.5 millimeters; breadth, 2.5.

Paratypes, length, 7.8 to 11 millimeters; breadth, 2.4 to 3.

Female.—Antennæ one-half as long as body, distinctly broadened and flattened apically.

Holotype, No. 52171 United States National Museum, between Fan-ta and Chung-kon-ts'uen, east of Nam-fung, westcentral Hainan Island, July 17, 1935, collected by the author; allotopotype, in the author's collection, same data; several paratopotypes, same data, collected on a felled tree. Ten paratypes,

in the Lingnan Natural History Museum, Tai-pin-ts'uen (Dwa-Bi), July 23, Yin-ko-au, June 23 and 24, Nam-po-ts'uen, August 24 to 26, 1935, F. K. To.

Differs from *P. kankauensis* Schwarzer (69, p. 26) in being stouter, with the pronotum more finely granulose, the elytral fasciæ broader, the elytral apices more transversely truncate, and in other respects.

Distribution.—Hainan Island.

Genus CHLOROPHORUS Chevrolat

Chlorophorus CHEVROLAT, Mem. Soc. R. Sci. Liège 18 (1863) 290 (reprint, 38); AURIVILLIUS, Col. Cat. 39 (1912) 395.

Anthoboscus MULSANT, Col. France Long. ed. 2 (1863) 166.

Clytanthus THOMSON, Syst. Cer. (1864) 190; LACORDAIRE, Gen. Col. 9 (1869) 68.

Caloclytus GAHAN, Fauna Brit. India Col. 1 (1906) 260.

Head much narrower than prothorax; antennal supports close; frons narrow; antennæ about one-half as long as body, third segment no longer than scape, unspined; prethorax subglobular, generally longer than broad; elytra subparallel-sided; first hind tarsal segment rarely longer than following segments combined.

Genotype.—*Clytus annularis* Fabricius.

Range.—Palearctic, Oriental, Ethiopian, and Australian Regions.

Key to the Hainan species of *Chlorophorus*.

1. Dark fascia at middle of elytra distinctly extending anteriorly along suture to one-half its distance from base..... 2.
- Dark fascia at middle of elytra transverse, very slightly or very narrowly produced anteriorly along suture..... 3.
2. Pubescence largely yellowish, elytra with a basal lunular mark.
annularis.
- Pubescence largely grayish, elytra with three basal white markings.
macaumensis.
3. Basal black lunular mark of each elytron broadly open externally..... 4.
- Basal black lunular mark of each elytron nearly closed externally.
separatus.
4. Pubescence dull sulphur yellow, postmedian dark fascia narrow.
hainanicus.
- Pubescence grayish, postmedian dark fascia broad, indistinctly defined behind *reductus*.

CHLOROPHORUS ANNULARIS (Fabricius).

Callidium annulare FABRICIUS, Mant. Ins. 1 (1787) 156, East Indies.

Clytus annularis FABRICIUS, Syst. Eleuth. 2 (1801) 352; CASTELNAU and GORY, Mon. Genre *Clytus* (1841) 102, pl. 19, fig. 121; WHITE, Cat. Col. Brit. Mus. 8 (1855) 283.

Chlorophorus annularis CHEVROLAT, Mem. Soc. R. Sci. Liège 18 (1863) 290; GAHAN, Ann. & Mag. Nat. Hist. (7) 5 (1900) 348, Hainan; MATSUSHITA, Journ. Fac. Agr. Hokkaido Imp. Univ. 34 (1933) 280; GRESSITT, Lingnan Sci. Journ. 18 (1939) 43.

Caloclytus annularis GAHAN, Fauna Brit. India Col. 1 (1906) 261.

Clytus bidens WEBER, Obs. Entom. (1801) 90.

Body brown to blackish brown, largely covered with yellow pubescence, except for five sublongitudinal, anteriorly confluent, black spots on pronotum, and a basal lunule, a median transverse band, and a large roundish preapical spot on each elytron.

Head finely granulose-punctate, subcarinate on frons. Antennæ barely over one-half as long as body; scape as long as third segment; fourth and fifth segments equal, nearly as long as third. Prothorax globose, about as long as broad, finely vermiculose on disc. Elytra nearly parallel, emarginate-truncate apically, with external and internal angles finely toothed. Posterior femora reaching to elytral apices; first hind tarsal segment barely longer than remaining segments combined.

Length, 10 to 16 millimeters; breadth, 2.6 to 4.

One female, in the author's collection, taken at Ta-hian, near Five Finger Mountains, altitude 600 meters, June 10, 1 male, at Ta-han, near Red Mist Mountain, altitude 750 meters, June 21, 2 specimens at Vo-lau, west of Nodoa, altitude 150 meters, July 9, taken by the author in 1935. The Lingnan Natural History Museum has specimens taken at Nodoa, June 1929, Sam-ah-kong, May 22, and Taai-chau Island, June 2, 1932, W. E. Hoffmann and O. K. Lau; "Hainan Is." April 28 and 29, 1932, W. E. Hoffmann; Cheung-kon-ts'uen, April 4, and Tai-pin-ts'uen, May 5, 1935, F. K. To.

Distribution.—Northern India; Burma; Siam; Tonkin; China; Japan; Malay Archipelago.

CHLOROPHORUS HAINANICUS Gressitt sp. nov. Plate 2, fig. 13.

Moderately slender; parallel; cylindrical. Body black, almost entirely clothed with dense pubescence: golden green above, pale sulphur-yellow beneath, pale grayish on antennæ, grayish green on legs; prothorax with three vague, small, black markings: a median, transverse, bilobed spot just behind center of disc, and a round spot just before middle of each side; each elytron marked with black as follows: (a) an externally open arc commencing on humerus and extending around to outer portion of disc just before end of basal third; and crossing (b) a brief transverse band at end of basal quarter; (c) a transverse band just before

middle, turning slightly forward at margin and suture, and (d) a narrower, less distinct band at beginning of apical quarter; ventral surfaces of body clothed with olive-green pubescence, sides of thoracic sterna and first two abdominal segments with lighter sulphury pubescence.

Head narrow, irregularly punctured; frons much wider below than above. Antennæ one-half as long as body, moderately slender. Prothorax oval-cylindrical, longer than broad, nearly as broad as elytral bases; disc microrugulose. Scutellum semi-circular, convex. Elytra parallel, micropunctulate, obliquely truncate apically, strongly emarginate at sides.

Holotype, length, 9.5 millimeters; breadth, 2.6.

Paratypes, length, 10.5 to 13; breadth, 2.4 to 4.4.

Holotype, male, United States National Museum, Dwa-Bi (Tai-pin-ts'uen), central Hainan, July 25, 1935, collected by the author; three paratypes, in the Lingnan Natural History Museum and the author's collection, Hau-ying-ts'uen, July 31, 1932, and Yin-ko-au, near Loi Mother Mountain, June 23 and 24, 1935, collected by F. K. To.

Differs from *C. annularis* (F.) in having merely a small bilobed black spot on the pronotum, an externally open lunule on each humerus, a narrow transverse band replacing preapical spots, and in other respects.

CHLOROPHORUS MACAUMENSIS (Chevrolat). Plate 2, fig. 11.

Clytus macaumensis CHEVROLAT, Rev. Zool. (1845) 98, Macao.

Anthoboscus macausnensis CHEVROLAT, Mem. Soc. R. Sci. Liège 18 (1863) 297.

Anthoboscus macaonensis DUNNING, Trans. Ent. Soc. London (1868) 128.

Chlorophorus macaumensis AURIVILLIUS, Col. Cat. 39 (1912) 403; GRESSITT, Lingnan Sci. Journ. 18 (1939) 43.

Body black, slightly brownish on antennæ and parts of legs. Surfaces clothed with gray, white, or brown pubescence: prothorax with an inverted cordate spot on center of disc and a smaller round spot on each side before middle; scutellum white; elytra with three white marks on basal portion of each and a golden auburn band just beyond middle of apical half.

Head distinctly punctured on frons and genæ, finely carinate on occiput. Antennæ a little more than one-half as long as body; scape a little longer than third segment; fifth segment a little longer than fourth and shorter than third. Prothorax nearly as

broad as elytral bases, longer than broad, finely subvermiculate. Elytra obliquely truncate apically. Posterior femora extending beyond elytral apices; first hind tarsal segment nearly as long as remaining segments combined.

Length, 7.5 to 13 millimeters; breadth, 2 to 3.25.

Specimens are in the Lingnan Natural History Museum from Nam-cha-chuen and Ngor-ma-chuen, July 8 to 10, 1929, Fifth Hainan Exp., Kachek, Hainan, May 3 to 6, and Hoihow, May 16, 1932, collected by F. K. To; Sam-ah-kong, southern Hainan, May 22 to 25, 1932, W. E. Hoffmann and O. K. Lau; Hau-ying-ts'uen, 6 miles southeast of Nodoa, July 31, 1932, F. K. To; and Tai-pin-ts'uen, May 10 and 11, Sam-ts'uen-kai-hui, July 1 to 3, 1935, F. K. To. Specimens were collected by the author at Nodoa, June 29, and Tai-pin-ts'uen (Dwa-Bi), July 25, 1935. A male was taken at "The Hummocks", northern Hainan, May 23, 1936, by G. Ros.

New to Hainan Island.

Distribution.—Macao; Hongkong; Hainan.

CHLOROPHORUS REDUCTUS Pic. Plate 2, fig. 12.

Chlorophorus reductus PIC, Mel. Exot. Ent. 37 (1922) 13, Tonkin; GRESSITT, Lingnan Sci. Journ. 18 (1939) 45.

Black; clothed with cinereous pubescence, whitish on sides of lower parts; elytra with a basal arcuate black mark on each, open exteriorly, a broad, median, transverse, black fascia, and apical third blackish brown, paler posteriorly.

Head small; frons constricted above. Antennæ two-thirds as long as body; third segment one and one-third as long as fourth. Prothorax slightly longer than broad, narrowed apically; disc granulose. Elytra subtransversely truncate apically, weakly dentate externally; surface densely and finely punctured. First hind tarsal segment as long as remaining segments united.

Length, 10.5 millimeters; breadth, 2.6.

A female was collected at Shuiman, Hainan, April 17, 1936, by G. Ros, and is in his collection; 2 males, in the Lingnan Natural History Museum, were taken at Sam-kwong-ts'uen, Lam-wan-tung, Kiung-shan District, August 6 to 11, and 1 female at Nam-liu-tin, July 27 and 28, 1935, by F. K. To.

New to Hainan.

These specimens differ from a North Kwangtung specimen in having the posterior dark band not distinctly margined behind.

Distribution.—Tonkin; South China; Hainan.

CHLOROPHORUS SEPARATUS Gressitt sp. nov. Plate 2, fig. 10.

Moderately long and cylindrical; prothorax about as broad as elytra. Body black, clothed with greenish-gray pubescence on head and prothorax; except for a transverse black bar on center of pronotum and a small round black dot on each side of prothorax; elytra in part clothed with yellowish-gray pubescence, each marked with glabrous black areas as follows: (a) a nearly complete lunular mark on basal third, including humerus, slightly broken at posterior external angles; (b) a subtransverse band at about middle, broadest at lateral margin and projecting very slightly forward at suture; and (c) an incomplete band at beginning of apical quarter, broad at external margin and narrowed to a point close to suture; ventral surfaces clothed with pale yellowish pubescence.

Head about one-half as broad as prothorax; eyes feebly swollen. Antennæ one-half as long as body; third segment distinctly longer than fourth. Prothorax strongly swollen, nearly as broad as long, narrowed apically; surfaces closely granulose-punctate. Elytra with sinuate margins and obliquely truncate apices; surfaces micropunctulate. First hind tarsal segment longer than following two combined.

Length, 12 millimeters; breadth, 3.

Holotype, in the Lingnan Natural History Museum, from Hainan Island, April 20, 1932, collected by Prof. W. E. Hoffmann.

Differs from *C. macaumensis* (Chevr.) in having the humeral black mark in the form of a lunule, isolated from the first transverse fascia, and with the pubescence uniform in color, the last elytral band incomplete, the prothorax distinctly narrowed apically, and in other respects.

Distribution.—Hainan Island.

Genus RHAPHUMA Pascoe

Rhaphuma PASCOE, Trans. Ent. Soc. London (2) 4 (1858) 240; LA-CORDAIRE, Gen. Col. 9 (1869) 72; GAHAN, Fauna Brit. India Col. 1 (1906) 271.

Raphuma THOMSON, Classif. Cer. (1860) 221.

Arcyphorus CHEVROLAT, Mem. Soc. R. Sci. Liège 18 (1863) 287.

Form slender; head with antennal insertions moderately separated; antennæ slender, unspined, about as long as body, with third segment distinctly longer than scape; prothorax longer than broad; elytra truncate; posterior femora extending beyond elytral apices; first hind tarsal segment longer than remaining segments combined.

Genotype.—*Rhaphuma placida* Pascoe.

Range.—Oriental and eastern Palearctic Regions.

RHAPHUMA PIELI Gressitt sp. nov. Plate 2, fig. 8.

Dark to light brown, largely clothed above with golden, below with pale sulphur-yellow, pubescence; head nearly black, almost entirely clothed, clypeus red-brown, labrum and palpi testaceous; antennæ pale ochraceous, duller apically; prothorax dull reddish brown, densely clothed above except for a pair of subparallel, longitudinal, ()-shaped stripes on the disc extending from basal fifth to apical eighth, and two subtriangular spots on each side, one spot centered just before middle, the other spot between it and base; scutellum densely pubescent; elytra chocolate-brown except for reddish-brown base, golden-pubescent except for external margin, a longitudinal discal stripe extending from near base to just beyond first third where it commences to turn towards external margin, a transverse band at middle extending anteriorly onto external margin, and a postmedian longitudinal stripe similar to basal stripe, but broader and uniting apically with marginal stripe before apical eighth; ventral surface dark red-brown, pubescence very sparse on anterior portion of prosternum, middle of metasternum and pleuroventral parts of bases of abdominal segments; legs dull ochraceous brown, femora dark brown on swollen portions and pale basally.

Head narrower than prothorax, parallel beyond eyes; frons rectangular, longer than broad; genæ long; gula heavily punctured. Antennæ fine, five-sixths as long as body; third segment longer than scape; scape longer than fourth segment and shorter than fifth. Prothorax one and one-third as long as broad, subcylindrical, slightly swollen above and at sides; brown area granulated; punctures noticeable through pubescence on base and sides. Scutellum bluntly triangular. Elytra with external margins moderately concave; apices subobliquely truncate, with both angles minutely toothed; nude areas minutely punctate. Hind femora extending one-fifth their length beyond elytral apices; first segment of hind tarsi twice as long as following two segments united.

Length, 9 millimeters; breadth, 2.

Holotype, female, in the Musée Heude, from Nodda, westcentral Hainan Island, March 26, 1936, Commander G. Ros.

Differs from *R. maculata* Schwarzer of India in having the head and prothorax narrower, the elytra shorter, the first segment of hind tarsus longer, and the pronotal and elytral mark-

ings much narrower and elongate. Named in honour of R. P. O. Piel, Director of the Musée Heude.

Distribution.—Hainan Island.

Genus DEMONAX Thomson

Demonax THOMSON, Classif. Cer. (1860) 226; CHEVROLAT, Mem. Soc. R. Sci. Liège 18 (1863) 268; GAHAN, Fauna Brit. India Col. 1 (1906) 280.

Grammographus CHEVROLAT, Mem. Soc. R. Sci. Liège 18 (1863) 285; LACORDAIRE, Gen. Col. 9 (1869) 71.

Elezira PASCOE, Trans. Ent. Soc. London (3) 3 (1869) 637.

Head with antennæ not very distantly inserted and frons generally wider below than above; antennæ nearly as long as body in male, with third segment usually no longer than scape, and third and fourth segments, at least, spined endoapically; prothorax swollen; elytra truncate; legs long, with first hind tarsal segment distinctly longer than remaining segments combined.

Genotype.—*Demonax nigrofasciatus* Thomson.

Range.—Oriental Region; Indo-Australian Subregion.

Key to the Hainan species of *Demonax*.

1. Prothorax subglobular, much broader than head; elytra subtransversely truncate; scutellum narrowly rounded..... 2.
- Prothorax subcylindrical, feebly swollen, not much broader than head; elytra obliquely truncate; scutellum broadly rounded; third to sixth antennal segments briefly spined apically..... *brevespinosus*.
2. Third and fourth antennal segments with very brief apical spines; prothorax subgranulose; elytra with apical portions sparsely pubescent, blackish brown *bimaculicollis*.
- Third and fourth antennal segments with long apical spines; prothorax broadly and shallowly reticulate-punctate; elytra with a distinct preapical transverse black band..... *matsushitai reticulicollis*.

DEMONAX BIMACULICOLLIS (Schwarzer) comb. nov.

Chlorophorus bimaculicollis SCHWARZER, Ent. Blätter 21 (1925) 28 Formosa; MATSUSHITA, Journ. Fac. Agr. Hokkaido Imp. Univ. 34 (1933) 278, 281.

Male.—Body blackish, somewhat brownish on posterior portions of antennæ, elytra and abdomen, and on coxæ and claw segments of tarsi. Surfaces clothed with pubescence as follows: pale gray on head and antennæ; tawny gray on prothorax with an indistinct black spot on each side of disc, gray on elytra, each with (a) a longitudinally oblique black stripe commencing at suture just behind scutellum and extending to mid-

line of disc just beyond end of basal quarter; (b) a broad band, transversely suboblique behind and concave anteriorly, extending forward along suture, leaving a narrow, curved, gray stripe between (a) and (b); and (c) nearly apical third sparsely clothed with dull tawny-brown; silvery white on mesosternum, metepisternum, posterior border of metasternum, and first, and apical portion of second, abdominal segment, remainder of ventral surfaces with pale-gray pubescence.

Head much narrower than prothorax. Antennæ nearly as long as body; scape as long as third segment; third and fourth segments briefly spined internally. Prothorax longer than broad, evenly swollen, granulose-punctate. Elytra hardly narrowed, sinuate-truncate apically, feebly dentate at external angles.

Length, 7.5 millimeters; breadth, 1.8.

Distribution.—Formosa; Hainan Island.

DEMONAX BREVESPINOSUS Gressitt sp. nov.

Male.—Large, somewhat narrowed posteriorly. Body black, slightly brownish on abdomen, legs, and fifth and following antennal segments. Surfaces largely clothed with gray or whitish pubescence, as follows: head and prothorax clothed with tawny-gray, latter with a transversely oval black spot on each side of disc and white pubescence along posteriolateral margins; antennæ and scutellum with whitish-gray pubescence; elytra with grayish pubescence, each marked with black bands, clothed with dull auburn as follows: (a) an irregular, somewhat U-shaped mark on basal third, more narrowed, and extending a little farther forward internally, reaching suture just behind scutellum; (b) a broad band just before middle, widest at external margin and attenuated anteriorly along suture a short distance, leaving between (a) and (b) a narrow, boomerang-shaped, gray fascia, narrowly interrupted at top of lateral declivity; and (c) a broad subtransverse band in posterior two-thirds of third quarter, somewhat constricted at suture; ventral surfaces with silvery-white pubescence, thinned and more grayish on middle of metasternum, last abdominal segment and bases of first four segments.

Head nearly as broad as prothorax, finely punctulate with a few coarser punctures on sides of occiput and behind eyes. Antennæ not quite as long as body; scape as long as third and fifth segments; third to fifth segments distinctly spined endo-

apically; sixth and seventh segments very briefly so. Prothorax longer than broad, feebly swollen, subgranulose, with a slight depression on each side of disc. Elytra slightly narrowed posteriorly; apices obliquely truncate, toothed externally.

Length, 15.5 millimeters; breadth, 3.5.

Holotype, male, in the Lingnan Natural History Museum, from Tai-pin-ts'uen (Dwa-Bi), Lam-ka-heung, Loi-mai Lia, Kiungshan District, Hainan, May 5 to 7, 1935, F. K. To.

Differs from *D. bimaculicollis* (Schwarzer) in being larger, and in having a much more cylindrical and more rugose prothorax and longer and more regularly banded elytra.

Distribution.—Hainan Island.

DEMONAX MATSUSHITAI RETICULICOLLIS Gressitt subsp. nov. Plate 2, fig. 6.

Female.—Small; slender; subcylindrical. Body black; abdomen and legs brownish black; claws reddish brown. Surfaces largely clothed with whitish-gray or silvery-white pubescence as follows: head evenly clothed with whitish gray; antennæ thinly clothed with whitish gray basally and with denser, paler pubescence apically; prothorax clothed with whitish gray, paler at sides, and with a suboblique brownish-black spot on each side of disc just before middle; each elytron clothed with whitish-gray pubescence except for the following black marks which are clothed with thin, dark-brown pubescence: (a) a spot covering front and side of humerus; (b) a short, oblique, cuneiform line on disc from near suture almost to end of basal quarter; (c) a broad band in second quarter, subtransverse on anterior margin and oblique posteriorly, broadest at external margin; and (d) a broad, transverse band occupying fourth fifth of elytron; ventral surfaces clothed with silvery white, except on last three abdominal segments, densest on mes- and metepisterna, posterior border of metasternum, and sides of posterior parts of first two abdominal segments.

Head with a few shallow punctures on occiput and postgenæ. Antennæ about three-fourths as long as body; scape not quite as long as third segment; third segment a little longer than fourth, third and fourth segments each with a long endoapical spine, spine of third segment nearly, that of fourth segment more than, one-half as long as respective segments; fifth segment as long as third but thicker, slightly longer than sixth. Prothorax barely longer than broad, shallowly reticulate on entire notum and sides. Elytra narrow, subparallel; apices truncate, slightly toothed externally. Posterior femora reaching

elytral apices; first hind tarsal segment one and one-half as long as remaining segments combined.

Length, 8.5 millimeters; breadth, 1.8.

Holotype, female, loan deposit of the California Academy of Sciences, from Ta-han, near Red Mist Mountain, altitude 750 meters, June 24, 1935, collected by the author.

Differs from *D. matsushitai* Gressitt¹⁰ in having the prothorax much more broadly reticulate, the elytral apices more strongly toothed, the first hind tarsal segment relatively shorter, and in other characters.

Genus SCLETHRUS Newman

Sclethrus NEWMAN, Entomol. 1 (1842) 247; THOMSON, Syst. Cer. (1864) 426; LACORDAIRE, Gen. Col. 9 (1869) 80; PASCOE, Trans. Ent. Soc. London (3) 3 (1869) 618.

Form elongate, often broadened posteriorly; head concave behind vertex, with a raised area on frons, eyes strongly swollen, subrounded and only slightly emarginate; antennæ slender, shorter than body, not very distantly inserted, with scape shorter than third segment; prothorax long, swollen above; elytra long, narrow basally; legs long and slender, posterior femora extending beyond elytral apices; first hind tarsal segment fully as long as remaining segments combined.

Genotype.—*Ibidion amoenus* Gory.

Range.—Philippines; Indo-China; Hainan.

SCLETHRUS STENOCYLINDRICUS Fairmaire. Plate 1, fig. 7.

Sclethrus stenocylindricus FAIRMAIRE, Ann. Soc. Ent. Belg. 39 (1895) 184, Tonkin.

Male.—Elongate, very slender, subcylindrical. Body black; antennæ and legs reddish castaneous, duller on tibiæ; scape and abdomen dark reddish brown; surfaces marked with areas of blue or silver-green scales as follows: head with a blue band on each side of occiput and a few scales bordering inferior lobes of eyes; pronotum with four small, round, greenish-blue spots, one at each side near middle, other two near base and slightly closer; scutellum with dense, greenish-silvery scales; each elytron with a small blue-green spot on disc at end of basal fifth segment, a fine line curving from external margin just behind middle and joining suture a little before middle, greenish blue on disc and greenish gold along suture, a subtransverse band of blue scales just behind beginning of apical quarter; ventral

¹⁰ Philip. Journ. Sci. 61 (1936) 97, pl. 1, fig. 10, Formosa.

surfaces with prosternum, median part of mesosternum, posterior part of mesepisternum, most of metepisternum and posterior borders of sides of first two abdominal segments silvery green; apical portion of last abdominal tergite bluish; antennæ with a few bluish scales at ends of third to fifth segments, small tufts of short, brown bristles endoapically on third and following segments.

Head sparsely punctured on sides of frons, densely rugose-punctate behind eyes and on occiput. Antennæ barely three-fifths as long as body; third segment considerably longer than scape and fifth segment, fourth segment shorter than fifth. Prothorax nearly twice as long as broad, slightly swollen at middle, densely punctured posteriorly with an impunctate area on each side, more finely punctured and pubescent anteriorly; scutellum triangular. Elytra heavily punctured anteriorly, finely so posteriorly.

Length, 16.5 millimeters; breadth, 2.8.

Female.—Antennæ barely one-half as long as body.

Length, 16 millimeters; breadth, 3.

One male specimen, in the author's collection, was taken by the author at Dwa-Bi (Tai-pin-ts'uen), near Loi Mother Mountain, July 24, 1935, flying in the sunlight in an opening in the jungle; 1 female, in the Lingnan Natural History Museum, was taken at Tai-pin-ts'uen, May 21, 1935, by F. K. To; 1 male at Nam-liu-tin, July 27.

New to Hainan.

Distribution.—Tonkin; Hainan.

TILLOMORPHINI

TILLORMORPHIDES Lacordaire, Gen. Col. 9 (1869) 88.

TILLOMORPHINÆ Pascoe, Trans. Ent. Soc. London (3) 3 (1869) 640.

EPIPEDOCERNI Gahan, Fauna Brit. India Col. 1 (1906) 305.

Eyes finely faceted, generally entire; antennæ rarely longer than body; prothorax constricted basally; anterior coxal cavities round, barely open behind; metepisternum narrow; legs short, particularly tarsi; tarsal claws weakly divergent; body dorso-ventrally compressed.

Genus EPIPEDOCERA Chevrolat

Epipedocera CHEVROLAT, Mem. Soc. R. Sci. Liège 18 (1863) 339; LACORDAIRE, Gen. Col. 9 (1869) 93; PASCOE, Trans. Ent. Soc. London (3) 3 (1869) 640; GAHAN, Fauna Brit. India Col. 1 (1906) 305.

Head vertical in front; eyes small, entire. Antennæ about as long as body in male, a little over one-half as long in female; segments flattened and serrate apically; prothorax strongly swollen laterally, narrow basally; basal margin emarginate; elytra short, slightly constricted medially, broad apically, bearing an ivory band near middle, frequently bispinose at apices; mesosternal intercoxal process very broad; femora slightly swollen; tibiæ carinate; first segment of hind tarsus nearly as long as following two segments united.

Genotype.—*Epipedocera zona* Chevrolat.

Range.—Oriental Region.

EPIPEDOCERA HOFFMANNI Gressitt sp. nov. Plate 2, fig. 5.

Female.—Small; elytra short and subparallel; antennæ broad. Dull black, antennæ and legs slightly shiny, elytra with a narrow, transverse, slightly sinuous, ivory-white, raised line just before middle, this line not quite reaching margins or suture; posterior lateral margins of prothorax, scutellum, mesepisterna, and posterior portion of metasternum and metepisterna densely clothed with silvery-white pubescence; coxæ and pro- and mesosternal processes finely clothed therewith; abdomen dark reddish brown, very finely pubescent; remainder of body glabrous except for labrum and last three antennal segments, latter very thinly pubescent.

Head short, vertical in front; occiput declivitous; eyes entire, nearly round; frons wider than high, slightly broader above than at apex; vertex fairly wide, weakly concave; surface finely and densely punctured, a median smooth line on vertex and frons. Antennæ about three-fourths as long as body, flattened apically; segments from third to base of ninth broadly canalicate above and below; sixth to last expanded, bluntly toothed externally at apices; last four segments nearly as broad as long; first eight segments shiny, last three dull; third segment barely longer than scape. Prothorax nearly as broad as long, wider at apex than at base, strongly protuberant and rounded at sides; broadly and shallowly reticulate-punctate, punctures small near apex and base, numbering about twenty-three in a median line from anterior to posterior margins, and about twenty-five from side to side at middle. Scutellum triangular. Elytra slightly narrowed before middle; apices broadly and conjointly rounded, bearing four short, sharp spines, one spine at sutural angle and another at middle of apex of each; surface coarse, unpolished,

clothed with small, deep punctures, more densely behind median ivory band, bearing numerous minute tubercles; abdomen densely and minutely punctulate; femora densely punctured; tibiae polycarinate.

Length, 6 millimeters; breadth, 1.85.

Holotype, female, loan deposit, California Academy of Sciences, from Ta-hian, near Five Finger Mountains, southcentral Hainan, altitude 600 meters, June 11, 1935, collected by the author.

Differs from *E. affinis* Chevrolat, to which it runs in Gardner's key to Indian species,¹¹ in being much more opaque and less shiny, and in having the antennæ shorter and broader, the prothorax with much wider punctures and with dense silvery pubescence along posteriolateral margins, the elytra shorter and more finely and deeply punctured, the metasternum more, and the abdomen less, pubescent.

Distribution.—Hainan Island.

CLEOMENINI

CLEOMENIDES Lacordaire, Gen. Col. 9 (1869) 97.

CLEOMENINÆ Pascoe, Trans. Ent. Soc. London (3) 3 (1869) 645.

CLEOMENINI Gahan, Fauna Brit. India Col. 1 (1906) 313; Liu, Lingnan Sci. Journ. 12 (1933) 474.

Head depressed, oblique; frons plane, rectangular; eyes lateral, finely faceted, emarginate; antennæ shorter or longer than body, with third segment distinctly longer than fourth; prothorax often constricted before and behind, rounded at middle of sides; elytra subparallel; anterior coxal cavities rounded, closed posteriorly; mesosternum with broad intercoxal process and externally closed acetabulæ; first abdominal segment long; femora pedunculate; tarsal claws widely divergent.

Genus DERE White

Dere WHITE, Cat. Col. Brit. Mus. 8 (1885) 248; THOMSON, Classif. Cer. (1860) 217; Syst. Cer. (1884) 422; LACORDAIRE, Gen. Col. 9 (1869) 100; GAHAN, Fauna Brit. India Col. 1 (1906) 315.

Head with antennal insertions somewhat raised; frons plane, squarish; upper eye lobes very small and narrow; antennæ shorter than body, third segment about as long as following two united, fourth segment shorter than fifth; apical segments expanded apically; prothorax a little longer than broad, rounded at sides; elytra flattened above, slightly broadened posteriorly,

¹¹ Indian Forest Records (12) 7 (1926) 204.

toothed apically; metepisternum with curved inner border; posterior femora not reaching elytral apices; first hind tarsal segment a little shorter than following two segments united.

Genotype.—*Dere thoracica* White.

Range.—Japan; China; Indo-China; Malacca; Borneo; India; Ceylon; Africa.

DERE MACILENTA Gressitt sp. nov.

Head, antennæ, scutellum, meso- and metasterna, abdomen, and legs black; prothorax reddish orange, anterior border blackish; elytra metallic blue-green; anterior coxæ reddish testaceous; middle coxæ partly brownish. Ventral surfaces of body largely clothed with silvery-white pubescence.

Head deeply punctured, more coarsely so on occiput; vertex moderately concave. Antennæ finely punctured, prothorax rugulose-punctate. Scutellum broadest at middle, acuminate apically. Elytra with dense puncturelike depressions opening externally, apex of each emarginate, with two acuminate spines, outer spine about twice as long as inner. Ventral surface densely, but shallowly, punctured; first abdominal segment as long as following two united. Anterior and middle femoral clubs smooth, posterior femoral clubs heavily punctured.

Length, 6.7 to 8.5 millimeters; breadth, 1.8 to 2.3.

Holotype, in the California Academy of Sciences, Tai-pin-ts'uen (Dwa-Bi), near Loi Mother Mountain, central Hainan, altitude 325 meters, July 23, 1935, taken by the author; several paratypes, in the Lingnan Natural History Museum. United States National Museum, and the author's collection, same data, some taken by F. K. To.

Differs from *D. affinis* Gahan, of northern India, in being slenderer, in having the prothorax distinctly longer than broad, the pronotum black apically and pitchy basally and less densely rugulose, and the elytra green instead of blue. The apex of each elytron has the outer spine stouter and longer and the inner spine shorter than in *affinis*.

Distribution.—Hainan; Tonkin.

STENASPINI

STENASPIDES Lacordaire, Gen. Col. 9 (1869) 166.

STENASPIDINÆ Pascoe, Trans. Ent. Soc. London (3) 3 (1869) 553, 653.

PURPURICENINI Gahan, Fauna Brit. India Col. 1 (1906) 183.

STENASPINI Aurivillius, Col. Cat. 39 (1912) 457.

Eyes finely faceted, deeply emarginate; antennæ longer than body in male, shorter and apically thickened in female; prothorax

tuberculate laterally; scutellum long, triangular; anterior coxæ globular, their cavities rounded externally and open posteriorly; middle coxal cavities open externally to epimera.

Genus PURPURICENUS Latreille

- Purpuricenus* LATREILLE, Regne Anim. ed. 2 5 (1829) 114; SERVILLE, Ann. Soc. Ent. France 2 (1833) 568; LACORDAIRE, Gen. Col. 9 (1869) 177; GAHAN, Fauna Brit. India Col. 1 (1906) 184.
Cyclodera WHITE, Stoke's Voy. App. 1 (1846) 510.
Philagathes LACORDAIRE, Gen. Col. 9 (1869) 176, part.

Head with prominent antennal supports; frons vertical; antennæ of female with apical segments angulate ectoapically; femora swollen; first hind tarsal segment shorter than following two segments combined; intercoxal process of mesosternum emarginate apically, tuberculate preapically.

Genotype.—*Cerambyx desfontainei* Fabr.

Range.—All Regions except Neotropical.

PURPURICENUS MALACCENSIS (Lacordaire). Plate 1, fig. 8.

- Philagathes malaccensis* LACORDAIRE, Gen. Col. 9 (1869) 176, note 2, Malacca.
Purpuricenus fasciatus BROGNIART, Nouv. Archiv. Mus. Paris (3) 3 (1891) 241, pl. 10, fig. 5.
Purpuricenus malaccensis GAHAN, Fauna Brit. India Col. 1 (1906) 185.

Male.—Black, elytra with basal eighth and a slightly wider band just behind middle pale yellow, both bands sinuous-edged, humeri black anteriorly. Clypeus and labrum with some yellow-brown hairs; elytra black-pubescent behind second fascia; ventral surface dull silvery pubescent, including postgenæ; antennæ glabrous.

Head abbreviated anteriorly, vertical in front, narrower than prothorax; occiput grossly, though shallowly, punctured; vertex deeply grooved. Antennæ slightly more than two and one-half times as long as body; scape concave basally, heavily punctured, three-fifths as long as third segment; third to tenth segments subequal; last segment longer than elytra. Prothorax broader than long, bluntly tuberculate just behind middle of sides; very finely vermiculate-punctate anteriorly and laterally, grossly punctured basally, a very slight tubercle on each side of middle of disc. Scutellum triangular. Elytra parallel, rounded posteriorly, finely and densely punctured. Metathorax and abdomen micropunctulate. Hind femora exceeding elytral apices; first segment of hind tarsus as long as following two combined.

Length, 21 millimeters; breadth, 6.8.

Female.—Head and mandibles smaller; antennæ just as long as body, fifth to tenth segments enlarged, angulately produced ectoapically; pronotum evenly granulose over entire surface.

Length, 18 millimeters; breadth, 6.

One male, in the Lingnan Natural History Museum, was taken at Tai-pin-ts'uen, May 21, 1935, and 1 female, in the author's collection, at Nam-liu-tin, Lam-wan-tung, Kiung-shan District, July 27, 1935, by F. K. To.

New to Hainan.

Distribution.—Assam; Burma; Siam; Malacca; Sumatra; Java; Hainan.

LAMIINÆ

LAMIARÆ Latreille, Hist. Nat. Crust. et Ins. 11 (1804) 282.

LAMIDÆ White, Cat. Col. Brit. Mus 8 (1855) 335.

LAMIITÆ Thomson, Classif. Cer. (1860) 1.

LAMIDES Lacordaire, Gen. Col. 9 (1869) 238.

LAMIINÆ Leconte and Horn, Smiths. Misc. coll. (21) 507 (1883) 313; Aurivillius, Col. Cat. 73 (1922) 1.

Head vertical anteriorly; antennal insertions generally distant from mandibles and partly surrounded by eyes; apical palpal segments acute; neck generally broad; prothorax cylindrical and often tuberculate laterally; scutellum usually rounded behind; anterior coxæ more or less prominent, their acetabulæ generally angulate externally; anterior tibiæ obliquely grooved on inner surfaces.

This division has very frequently been considered as a family and probably warrants separation more than any other major group of the longicorns except the Disteniinæ.

Key to the Hainan tribes of Lamiinæ.

1. Tarsal claws simple, lacking teeth..... 2.
Tarsal claws toothed or appendiculate basally..... 21.
2. Antennal scape with a cicatrix at apex..... 3.
Antennal scape lacking a true cicatrix at apex..... 7.
3. Cicatrix of scape generally completely closed, occasionally feebly margined internally 4.
Cicatrix of scape incomplete, open internally..... 5.
4. Frons more or less rectangular..... MONOCHAMINI.
Frons strongly narrowed above..... AGNIINI.
5. Head touching coxæ in repose..... 6.
Head not touching coxæ in repose..... BATOCERINI.
6. Middle tibiæ generally lacking a preapical groove..... MESOSINI.
Middle tibiæ generally possessing a preapical groove..... ANCYLONOTINI.

7. Middle coxal cavities open externally to epimera..... 8.
Middle coxal cavities closed externally to epimera..... 18.
8. Tarsal claws divergent, forming an angle of less than 90° 9.
Tarsal claws divaricate, forming an angle of about 180° 13.
9. Middle tibiæ with a preapical oblique groove externally..... 10.
Middle tibiæ generally lacking a preapical oblique groove.... NIPHONINI.
10. Front of head more or less rectangular..... 11.
Front of head trapeziform, broader below than above; antennæ with long hairs 12.
11. Anterior coxæ very prominent, produced posteriorly, conical or cylindrical XYLORHIZINI.
Anterior coxæ not very prominent, projecting but slightly above level of intercoxal process APOMECEYNINI.
12. Antennæ very slender, much longer than body; head moderately angulate HIPPOPSINI.
Antennæ hardly longer than body; head strongly produced at vertex, frons forming an acute angle with top of head..... SPALACOPSINI.
13. Middle tibiæ with a preapical oblique groove externally..... 14.
Middle tibiæ lacking a preapical oblique groove..... 16.
14. Eyes emarginate 15.
Eyes divided NYCTIMENINI.
15. Scape club-shaped, granulose; elytra never carinate.... DORCASCHEMATINI.
Scape slender, gradually thickened; elytra generally carinate laterally. GLENEINI.
16. Antennal scape slender or subcylindrical; head not touching coxæ in repose 17.
Antennal scape club-shaped; head resting on coxæ in repose.... HECYRINI.
17. Metepisternum narrow, subparallel-sided..... APODASYINI.
Metepisternum triangular, very broad anteriorly; elytra sometimes carinate laterally SAPERDINI.
18. Tarsal claws divaricate 19.
Tarsal claws divergent, forming angles of less than 90° PTERICOPTINI.
19. Antennal scape slender, subcylindrical, simple; antennal insertions widely separated 20.
Antennal scape club-shaped, bearing a false granular cicatrix before apex; antennal insertions fairly close..... XENOLEINI.
20. Anterior coxal cavities rounded..... ACANTHOCININI.
Anterior coxal cavities angulate externally..... ESTOLINI.
21. Eyes simply emarginate, not divided..... 22.
Eyes completely divided TETRAOPINI.
22. Elytra generally carinate laterally; middle three abdominal segments shorter than first and last..... GLENEINI.
Elytra rarely carinate along edge of lateral declivity; first four abdominal segments subequal in length..... PHYTOECIINI.

MONOCHAMINI

MONOHAMMIDES Lacordaire, Gen. Col. 9 (1869) 299.

MONOCHAMINI Aurivillius, Col. Cat. 73 (1922) 73.

Cicatrix of antennal scape distinctly enclosed by a raised line, at least externally; vertex generally concave and somewhat angulate between antennal supports; frons more or less rectangular; middle coxal cavities open externally to epimera; elytra longer than head and body combined; antennæ distinctly longer than body in male, often more than twice as long; prothorax usually tuberculate laterally.

The tribe contains over one hundred genera, most of which are Oriental. Nine genera are known to me from Hainan.

Key to the Hainan genera of Monochamini.

1. Mesosternal process neither tuberculate nor swollen..... 2.
Mesosternum tuberculate, or at least feebly swollen along middle..... 3.
2. Cicatrix of first antennal segment completely enclosed..... *Monochamus*.
Cicatrix of first antennal segment open internally..... *Dihammus*.
3. Inferior lobes of eyes vertical (deeper than wide)..... 4.
Inferior lobes of eyes horizontal (wider than deep)..... 7.
4. Mesosternal process with a strong perpendicular process..... 5.
Mesosternal process with a horizontal keel below..... 6.
5. Third antennal segment with a prominent tuft of hair..... *Aristobia*.
Third antennal segment lacking a prominent tuft of hair.... *Melanauster*.
6. Antennal cicatrix hairy; elytra subtruncate apically..... *Blepehæus*.
Antennal cicatrix nearly glabrous, very small; elytra rounded apically.
Hainanhammus.
7. Third antennal segment fully twice as long as first; elytra subtruncate, spotted with chalky-white pubescence..... 8.
Third antennal segment less than twice as long as first; elytra rounded apically; vertex extremely narrow between antennal insertions; anterior tarsi with spreading black bristles..... *Pelargoderus*.
8. First segment of anterior tarsus normal in both sexes; prothorax longer than broad¹², very weakly toothed laterally, transversely vermiculose on disc; anterior coxal cavities slightly open behind..... *Psacothæa*.
First segment of anterior tarsus strongly spined ectoapically in male, angulate in female; prothorax broader than long, strongly toothed laterally; anterior coxal cavities closed behind..... *Epepeotes*.

Genus PSACOTHEA Gahan

Psacothæa GAHAN, Ann. & Mag. Nat. Hist. (6) 2 (1888) 400.

Anterior coxal cavities slightly open behind; inferior lobes of eyes wider than deep; antennæ more than twice as long as body in male, nearly or fully twice as long in female; scape less than one-half as long as third segment, broad apically; prothorax as long as, or longer than, broad, very weakly, to moderately,

¹² This does not apply to *Psacothæa* from North China.

tuberculate laterally, vermiculate on disc; elytra briefly emarginate-truncate apically; form very slender; elytra spotted with chalky pubescence.

Genotype.—*Monohammus hilaris* Pascoe.

Range.—China; Japan; Ryu Kyu islands; Formosa; Hainan.

PSACOTHEA INARMATA Gressitt sp. nov. Plate 3, fig. 2.

Male.—Elongate, head and prothorax over one-half as long as elytra. Black, almost entirely clothed with fine gray pubescence, marked with areas of thick, chalky, pale-yellow pubescence as follows: each side of frons with a vertical stripe; genæ each with a horizontal stripe; top of head with three longitudinal stripes, one commencing between antennal tubercles, each of the other two from behind emargination of eyes, and continuing as a wider stripe for entire length of side of pronotum; each elytron with five moderately large spots arranged in a weakly convex arc from middle of base to before apex, besides some that are nearly as large, along external margin and a number of small ones scattered over surface, mostly behind middle; genal stripe continued along lower side of thorax as far as base of metasternum; prosternum with a median ventral stripe on latter two-thirds; metathorax with small spots at base and apex; abdomen with two rows of rounded spots on each side; base of fourth and following antennal segments briefly pale pubescent.

Head moderately long, feebly punctured; frons carinate, narrowed at base of antennal insertions; vertex narrowly concave between antennal insertions. Antennæ more than two and one-half times as long as body; third segment over twice as long as scape; fourth three-fifths as long as third; last segment a little longer than third. Prothorax longer than broad, narrower at apex than at base, slightly swollen at sides and practically intuberculate. Elytra narrowed, weakly bicostate, finely punctured, subseriately in part; narrowly emarginate at apices, Anterior femora as long as head and prothorax united; tarsi slender.

Length, 19 to 26 millimeters; breadth, 6 to 8.2.

Female.—Antennæ slightly more than twice as long as body; prothorax barely longer than broad, weakly tuberculate laterally; legs shorter than in male.

Length, 22 millimeters; breadth, 7.

Holotype, male, No. 53465 United States National Museum, Dwa-Bi (Tai-pin-ts'uen), central Hainan Island, altitude 350 meters, July 26, 1935, taken by the author; allotype, female, in

the author's collection, Ta-han, central Hainan, altitude 750 meters, June 22, 1935, taken by the author; paratype, male, in the Lingnan Natural History Museum, Chung-mai, Hainan, August 18, 1932, F. K. To.

Distribution.—Hainan Island.

Genus **EPEPEOTES** Pascoe

Epepeotes PASCOE, Proc. Zool. Soc. London (1866) 249; Trans. Ent. Soc. London (3) 3 (1866) 300; LACORDAIRE, Gen. Col. 9 (1869) 301, 312.

Anterior coxal cavities closed posteriorly; first segment of anterior tarsus of male with an ectoapical spine; scape nearly one-half as long as third antennal segment; prothorax broader than long, strongly tuberculate laterally; anterior legs long, their tibiae longitudinally grooved externally in male; elytra subtruncate apically.

Genotype.—*Lamia lusca* Fabricius.

Range.—India; Siam; Hainan; Malay Peninsula and Archipelago, including Philippine Islands and New Guinea.

EPEPEOTES TONKINENSIS (Aurivillius) comb. nov. Plate 3, fig. 1.

Macrochenus tonkinensis AURIVILLIUS, Archiv f. Zoologi (13) 9 (1920) 12.

Male.—Large, moderately stout; prothorax strongly tuberculate. Body black, largely clothed with thin, silvery-gray pubescence and marked with the following stripes and spots of dense pubescence, white below and creamy yellow above: head with lower and inner borders of eyes, a stripe along vertex, and a longitudinal stripe extending back from both upper and lower eye lobes on each side, white or creamy; pronotum with a creamy stripe on each side, continued from upper lateral stripes of head; each elytron with a short stripe at middle of base, constricted or broken in middle, and a number of irregularly placed spots of different sizes on posterior two-thirds; ventral surfaces with a broad white stripe on each side of thorax, continued from lower lateral stripes of head, and a white spot near lateral margin of each abdominal sternite; antennae black, almost glabrous; legs clothed with gray.

Head nearly impunctate, rounded-concave between antennal supports. Antennae slightly more than twice as long as body, tapering; scape strongly thickened apically, hardly more than one-half as long as third segment; fourth segment two-thirds as long as third segment and slightly longer than fifth, last seg-

ment subequal to third. Prothorax broader than long, with a broad-based, subacute tubercle at each side; disc with only a few scattered, shallow punctures and some feeble corrugations across middle before center. Elytra strongly narrowed posteriorly, subobliquely truncate apically; surfaces rather closely punctured on basal two-thirds.

Length, 18 to 27 millimeters; breadth, 6 to 9.

Female.—Body more nearly parallel-sided; antennæ one and one-half as long as body, third and following segments with white pubescence on basal portions.

Length, 24 millimeters; breadth, 7.5.

One male, in the author's collection, Chung-kon-ts'uen, central Hainan Island, altitude 275 meters, July 19, 1935, taken by the author; 1 female, in the Lingnan Natural History Museum, a grove 1.5 miles south of Nodoo, Hainan, June 27, 1929, Lingnan Univ. Fifth Hainan Island Exped.; additional specimens were taken at Chung-kon-ts'uen, April 11 and 12, and at Tai-pin-ts'uen, May 1 to 4, 1935, by F. K. To.

New to Hainan.

Distribution.—Tonkin; Hainan.

Genus PELARGODERUS Serville

Pelargoderus SERVILLE, Ann. Soc. Ent. France 6 (1835) 72; LACORDAIRE, Gen. Col. 9 (1869) 301, 312.

Paragnoma BLANCHARD, Voy. Pole Sud 4 (1857) 298.

Rhamses THOMSON, Archiv Ent. 1 (1857) 177.

Frons higher than wide, narrowed above middle; antennal insertions broad, narrowly separated; inferior lobes of eyes wider than deep; antennæ two or more times as long as body in male, one and one-half to two times as long in female; cicatrix entire; prothorax generally as long as broad, with small lateral tubercles; elytra granulose basally; mesosternal process tuberculate.

Internally multituberculate anterior femora are normally characteristic of the species of this genus, but in the species found on Hainan these are lacking.

Genotype.—*Pelargoderus vittatus* Serville.

Range.—Oriental Region; Indo-Australian Subregion.

PELARGODERUS APICALIS Gahan. Plate 3, fig. 7.

Pelargoderus apicalis GAHAN, Ann. & Mag. Nat. Hist. (5) 7 (1900) 348, Hainan Island.

Male.—Fairly large, slender, feebly narrowed posteriorly. Body largely black; antennæ and legs dark reddish brown, apices of segments of former blackish; surfaces irregularly clothed with tawny-brown to black pubescence of various thicknesses, giving a complex pattern: head rather evenly clothed with pale, rusty pubescence, except along middle of occiput and frons and behind eyes; antennæ clothed with pale rusty on first three segments, except at apex of third, and very sparsely clothed beyond; prothorax with an incomplete, longitudinal, reddish-tawny stripe on each side of midline and another on each side above tubercle, intervening area irregularly pubescent; scutellum densely clothed with reddish tawny, except along middle; elytra with irregular, longitudinal, reddish-tawny stripes on basal quarter, and more distinct, paler stripes at beginning of apical third, apices with irregular subconfluent blotches, central portion irregularly marked with small, tawny spots and larger black spots; ventral surfaces and legs moderately clothed with tawny brown, rather thinly so along midventral line and middle of sides. Antennæ sparsely ciliate beneath.

Head not distinctly punctured; antennæ twice as long as body; prothorax subrugose above, with small lateral tubercles; elytra heavily punctured and subnodose basally; anterior tarsi broad, with flying lateral hairs.

Length, 20 to 27 millimeters; breadth, 6.7 to 8.5.

Three males, in the Lingnan Natural History Museum and in the author's collection: 1 at Nam-po-ts'uen, Ch'eng-mai District, Hainan, August 22, 1935, F. K. To; 1 at Ta-hau, near Vo-lau, western Hainan, July 7, and 1 at Dome Mountain (Sa-bo-leng, Sa-ko-lia), west of Nam-fung, July 13, 1935, collected by the author.

Distribution.—Hainan Island.

Genus *MONOCHAMUS* Guérin-Meneville

Monochamus GUÉRIN-MENEVILLE, Dict. Class. d'Hist. Nat. 9 (1826) 186; THOMSON, Classif. Cer. (1860) 97; PASCOE, Trans. Ent. Soc. London (3) 3 (1866) 292.

Monohammus MULSANT, Col. France Long. (1839) 173; LACORDAIRE, Gen. Col. 9 (1869) 314.

Monohamus GUÉRIN-MENEVILLE, Icon. Regne Anim. Ins. (1844) 242.

Monochammus SEIDL., Fauna Balt. (1875) 139.

Frons about as high as wide, emarginate laterally; antennal tubercles strongly raised, divergent; inferior lobes of eyes about

as deep as, or slightly deeper than, wide; antennæ two to three times as long as body in male, one and one-half to two times as long or longer in female, lacking tufts or fringes; scape gradually thickened to apex, which bears a prominent and completely closed cicatrix; prothorax with sharp lateral tubercles, disc feebly swollen behind middle; elytra narrowed posteriorly, at least in male, generally punctured basally; mesosternal process nontuberculate.

Genotype.—*Lamia sutor* Fabricius.

Range.—Palearctic, Nearctic, Oriental, and Ethiopian Regions.

Key to the Hainan species of Monochamus.

Body largely brown or rusty, irregularly clothed with pubescence; a round black spot on each elytron behind middle; body less than 25 millimeters long *bimaculatus*.

Body largely clothed with pale bluish-white pubescence, marked with oblique bands of glabrous black spots; body more than 25 millimeters long. *versteegi*.

MONOCHAMUS BIMACULATUS Gahan.

Monohammus bimaculatus GAHAN, Ann. & Mag. Nat. Hist. (6) 2 (1888) 260; *ibid.* (7) 5 (1900) 348, Hainan.

No description is given since the species is not represented in the Hainan material at hand, and Gahan's specimen might possibly have represented *M. filicornis* Gressitt, which is almost identical in appearance with *bimaculatus* and replaces it to the east. Both are rather small species, *bimaculatus* being stout and dorsoventrally somewhat compressed, with thick antennæ, while *filicornis* is narrower and more cylindrical, with the antennæ much slenderer and longer. Both have a round velvety black spot behind the middle of each elytron, but *bimaculatus* is rust-brown and *filicornis* gray-brown, and the former is more coarsely punctured above.

Distribution.—Northern India; Burma; Siam; Hainan(?).

MONOCHAMUS VERSTEEGI Ritsema.

Monohammus versteegi RITSEMA, Notes Leyden Mus. 3 (1881) 155; Midden-Sumatra (4) 6 (1887) 133, pl. 3, fig. 4; GAHAN, Ann. Mus. Civ. Hist. Nat. Genova 34 (1894) 34; MAXWELL-LEFROY, Ind. Ins. Life (1909) 376, fig. 256.

Monochamus versteegi AURIVILLIUS, Col. Cat. 73 (1922) 96.

Male.—Large, elongate, narrowed and rounded posteriorly. Body black, clothed with smooth, pale, bluish-white pubescence, except for following glabrous black markings: head black only along four narrow sublongitudinal stripes on dorsal surface behind eyes; antennæ black for progressively greater proportions

of distal ends of third and following segments; prothorax with a shiny, elongate, median, diamond-shaped area and a smaller, elongate-oval area on each side of disc, and upper portions of lateral spines, black; elytra with about seven suboblique bands formed of isolated, squarish or oblong black spots, becoming smaller posteriorly. Pronotum with a few fine, erect, black hairs; elytra with short, oblique, black bristles.

Head nearly impunctate; vertex broadly concave; frons wider than high; antennæ two and two-thirds times as long as body; prothorax subacutely spined laterally, impunctate on median shiny area, a few foveate punctures forming an oblique row on each side behind middle; elytra punctured throughout, somewhat more deeply so on basal third.

Length, 27 to 31 millimeters; breadth, 9.5 to 11.

Female.—Subparallel; antennæ one and two-thirds as long as body.

Length, 32 to 34 millimeters; breadth, 11.

Three specimens, in the Lingnan Natural History Museum and in the author's collection, were collected at Tai-pin-ts'uen (Dwa-Bi), near Loi Mother Mountain, altitude 400 meters, 2 by F. K. To, May 10 and 11, 1935, and 1 by the author, July 20, 1935; 1 was taken by the author at Nodoa, June 11, 1935.

New to China.

Distribution.—Sumatra; Burma; Assam; Northern India; Hainan.

Genus DIHAMMUS Thomson

Dihammus THOMSON, Syst. Cer. (1864) 80, 381; PASCOE, Trans. Ent. Soc. London (3) 3 (1866) 290.

Haplohammus BATES, Journ. Linn. Soc. London Zool. 18 (1884) 239.

Frons fully as wide as high, broader above than below; vertex strongly concave; inferior lobes of eyes about as wide as deep; antennæ two or three times as long as body in male, one and one-half to two times as long in female; scape short, conico-cylindrical, with a large, internally open cicatrix at apex; prothorax transverse, strongly tuberculate laterally, only slightly irregular on disc, transversely grooved near apex and base; scutellum short and rounded; elytra narrowed and rounded apically; mesosternal process even, or feebly swollen. Body clothed with close pubescence.

Genotype.—*Monochamus longicornis* Thomson.

Range.—Oriental, Australian, and eastern Palæarctic Regions.

Key to the Hainan species of Dihammus.

Pubescence tawny golden-orange, silvery white along sides of thorax; frons nearly impunctate; over 26 millimeters long..... *sericeomicans*.

Pubescence dark golden brown, highly variable, silvery along sides of elytra; frons irregularly punctured; less than 24 millimeters long.

speciosus.

DIHAMMUS SERICEOMICANS (Fairmaire).

Monochamus sericeomicans FAIRMAIRE, Ann. Soc. Ent. France (6) 9 (1889) 67.

Dihammus sericeomicans SCHWARZER, Entom. Blätter 21 (1925) 59.

Male.—Fairly large, elongate, subcylindrical, only slightly narrowed posteriorly. Body blackish brown, entirely clothed with close, velvety pubescence, golden orange-brown above, with varied markings, and tawny-golden and silvery-cream beneath: head and antennal scape clothed with light gray-brown basally and blackish brown apically, the former predominating on basal segments and the latter on apical segments; pronotum and elytra golden orange-brown, with lighter and darker areas determined by pubescence lying in different directions; scutellum, and pronotum on middle of base and behind each lateral tubercle, tawny-white; ventral surfaces tawny-golden along middle of thoracic sternites and on most of abdomen, silvery cream along sides, on bases of femora, and on tibiae and tarsi, remainders of femora golden-orange.

Head lacking distinct punctures except around upper portions of eyes and inner faces of antennal tubercles; antennae twice as long as body; prothorax bluntly tuberculate laterally, finely asperate-punctate on somewhat irregularly swollen disc; scutellum broadly rounded; elytra finely but deeply punctured on basal third.

Length, 28 millimeters; breadth, 9.

Female.—Subparallel, rounded posteriorly; antennae one and three-fifths as long as body.

Length, 28 to 32 millimeters; breadth, 9 to 10.

A male was taken on Hainan Island in 1932 by Prof. W. E. Hoffmann; a female was collected at Naam-fung, July 25, and another female at Nai-suen, September 6, 1932, by F. K. To.

New to Hainan.

Distribution.—South China; Hainan Island.

DIHAMMUS SPECIOSUS (Gahan).

Haplohammus speciosus GAHAN, Ann. & Mag. Nat. Hist. (6) 1 (1888) 274, China and Hongkong.

Dihammus speciosus AURIVILLIUS, Col. Cat. 73 (1922) 99; GRESSITT, Lingnan Sci. Journ. 18 (1939) 54.

Male.—Body dark reddish brown to blackish, entirely clothed with velvety pubescence of shades varying from dark reddish brown through golden-amber to silvery gray-green: head tawny-brown in front, golden above and at sides; antennæ gray-brown except for apices of third and following segments which are reddish brown; prothorax dark brown with pinkish-golden markings, according to angle of light; scutellum tawny; elytra dark brown, varying to pinkish golden on sutural halves of discs, grayish brown externally and silvery gray-green along intervening strip from humerus to apex of each; ventral surfaces and legs pale tawny-golden.

Head irregularly punctured; vertex broadly concave; antennæ two and three-fourths times as long as body, last segment as long as elytra; prothorax transverse, bluntly tuberculate laterally, disc slightly irregular with a few foveæ; scutellum short and rounded; elytra strongly punctured on basal half.

Length, 17.5 to 21 millimeters; breadth, 4.5 to 6.

One male, in the Lingnan Natural History Museum, was collected at Nam-po-hui, Lin-kao, Hainan, May 27 and 28, 1932, by F. K. To.

New to Hainan.

Distribution.—South China; Hainan; Formosa.

Genus MELANAUSTER Thomson

Melanauster THOMSON, *Physis* 2 (1868) 181; LACORDAIRE, *Gen. Col.* 9 (1869) 301, 326; MATSUSHITA, *Journ. Fac. Agr. Hokkaido Imp. Univ.* 34 (1933) 320, 331.

Frons subrectangular, fully as high as wide; vertex deeply concave between antennal insertions; inferior lobes of eyes deeper than wide; antennæ about one and one-half to one and three-fourths times as long as body in male, and about one and one-third as long in female, lacking distinct tufts of hairs or internal fringes; antennal scape large, conicocylindrical, cicatrix large, not always distinctly margined; prothorax broad, strongly tuberculate laterally, somewhat swollen behind middle of disc; elytra broad, rounded posteriorly, often granulose basally; mesosternal process strongly tuberculate.

Genotype.—*Cerambyx chinensis* Förster.

Range.—Eastern Asia.

Key to the Hainan species of Melanauster.

1. Elytral bases with scattered granulelike nodes and black bristles; apices of elytra with two or three small white blotches; scutellum broadly rounded posteriorly 2.

Elytral bases lacking small nodes and bristles; each elytron with about nine bluish-white spots, one large spot at apex of each; extreme apices and bases of antennal segments white; scutellum triangular.

macrospilus.

2. Antennæ with bases only of segments clothed with pale pubescence; elytral bases with numerous nodes; pubescent spots on elytra mostly arranged in transverse bands..... *chinensis.*

Antennæ with extreme apices and bases of segments clothed with bluish-white pubescence; elytral bases with but few nodes; pubescent spots on elytra irregularly arranged, not in transverse bands.

pirouletii similis.

MELANAUSTER CHINENSIS (Förster).

Cerambyx farinosus HOUTTUYN, Natuurl. Hist. (1) 9 (1766) 536, pl. 75, fig. 2 (not of Linnæus); DONOVAN, Ins. China (1798) pl. 6.

Cerambyx chinensis FÖRSTER, Nov. Spec. Ins. (1771) 39, China.

Lamia punctator FABRICIUS, Gen. Ins. (1776) 230; WESTWOOD, in Donovan's Ins. China ed. 2 (1842) 12, pl. 6, fig. 3.

Cerambyx pulchricornis VOET, Cat. Col. 2 (1778) 22, pl. 20, fig. 95.

Cerambyx sinensis GMELIN in Linnæus, Syst. Nat. ed. 13 (1) 4 (1790) 1863.

Cerambyx punctator OLIVIER, Ent. (4) 67 (1795) 69, pl. 8, fig. 50.

Callophophora macularia THOMSON, Syst. Cer. (1865) 553, North China.

Melanauster chinensis THOMSON, Physis 2 (1868) 182, note 1; HEYNE-TASCHENBERG, Exot. Käfer (1906) 241, pl. 37, fig. 9; AURIVILLIUS, Col. Cat. 73 (1922) 108; GRESSITT, Lingnan Sci. Journ. 18 (1939) 55.

Male.—Shiny black; clothed with areas of white or pale-bluish pubescence: head sparsely clothed with pale blue on genæ, middle of occiput, and edges of frons; antennæ thinly clothed with bluish white on undersides of scape, second segment, and bases of third and following segments, for successively greater portions towards apices; pronotum with a small spot on each side before middle; elytra with about five transverse bands of squarish or oblong spots of dense, white pubescence; ventral surfaces and legs clothed with thin, pale-bluish pubescence.

Head deeply concave between antennal insertions; frons and occiput with punctures of various sizes; antennæ one and three-fourths times as long as body, third to tenth segments gradually shorter; prothorax transverse, acutely tuberculate laterally, smooth in middle, swollen behind center, asperate-punctate on each side of middle; elytra densely nodose at bases, sparsely punctured, punctures bearing fine hairs.

Length, 27 to 28 millimeters; breadth, 10 to 10.5.

Female.—Larger; elytra not narrowed posteriorly; antennæ one and one-fourth as long as body.

Length, 23 millimeters; breadth, 12.

Specimens were collected by the author at Ta-han, June 7, and Chung-kon, July 18, 1935; 1 was taken for the author at Hoihow in July, 1935, by Miss Betty Steiner. The Lingnan Natural History Museum has specimens from Nodoa, June 26, 1929, Lin-fa-ling, July 21, 1929, Hoihow, April, 1932, W. E. Hoffmann; Kachek, May 3 to 6, Nodoa, June 4 to 20, 1932, Cheung-kon-ts'uen, April 1 to 3, Faan-na, July 12, Tai-pin-ts'uen, July 25, Hau-ying-ts'uen, August 1, Sam-kwong-ts'uen, August 12, and Nai-suen, September 10, 1935, F. K. To.

Distribution.—China; Hainan; Formosa; Ryu Kyu Islands; Japan; Korea.

MELANAUSTER MACROSPILUS Gahan.

Melanauster macrospilus GAHAN, Ann. & Mag. Nat. Hist. (7) 5 (1900) 349, Hainan.

Male.—Rather long, narrowed posteriorly. Shiny blue-black, with a slight purplish tinge; body marked with areas of bluish-white pubescence: on sides of frons, mandibles, and genæ, undersides of scape, and extreme bases and apices of following segments, with last three segments largely white, an incomplete longitudinal stripe on each side of pronotum, a spot on apical portion of scutellum, about nine fairly large, and two or three smaller, areas of dense bluish-white pubescence on each elytron, the largest areas being an oval area at apex, a transverse oblong area at end of basal third, and a rounded area at base; sides of thorax and abdomen with transverse areas of paler bluish, apices of femora and upper portions of tarsi densely clothed with bluish.

Head impressed along median line, deeply concave between antennal insertions; frons and occiput with two sizes of punctures; antennæ nearly one and three-fourths as long as body, third segment feebly arcuate; prothorax with lateral tubercles strong, not very acute, directed slightly backwards at apices, disc swollen behind center and foveate-punctate on each side; elytra entirely smooth, lacking granules or distinct punctures, glabrous on nonpubescent portions.

Length, 32 millimeters; breadth, 12.

One male, in the Lingnan Natural History Museum, collected at Tai-pin-ts'uen, May, 1935 by F. K. To; 1 male, taken by the author at Ta-hian, near foot of northern side of Five Finger Mountains, southcentral Hainan, altitude 600 meters, June 14, 1935.

Distribution.—Hainan Island.

MELANAUSTER PIROULETI SIMILIS Gahan comb. nov.

Melanauster similis GAHAN, Ann. & Mag. Nat. Hist. (7) 5 (1900)
350, Hainan Island.

Female.—Moderately large, broad, slightly narrowed posteriorly. Shiny black, marked with white pubescence, which is thin and slightly tinged with grayish-blue on head, scape, ventral surfaces, and legs; sides of genæ more densely clothed, a lateral, triangular area on each side of metasternum glabrous; antennæ, beyond second segment, clothed with grayish white at extreme bases and apices of each segment, apical portions a little more extensively so than basal portions; prothorax with an incomplete, suboblique stripe on each side of disc from apex to base; scutellum with only a few pale adpressed hairs; elytra marked with irregularly arranged, rounded-oval spots of dense white pubescence, about thirteen large, and several small, spots on each elytron. Prothorax and elytra sparsely clothed with suberect, black bristles.

Head with punctures of various sizes on frons, but only scattered larger punctures on middle of occiput; antennæ nearly one and one-third as long as body; prothorax with lateral tubercles acute, directed slightly backwards, lateral portions of pronotal disc swollen and impunctate before middle, strongly asperate-punctate; scutellum broad, rounded behind; elytra sparsely nodose at base, with five scattered punctures on rest of surface.

Length, 34 millimeters; breadth, 12.5.

A single female was taken by the author at Ta-hian, near foot of Five Finger Mountains, Hainan, altitude 600 meters, June 19, 1935.

Distribution.—Hainan Island.

Though the arrangement of the pubescent spots of the elytra is rather different from that of typical *M. pirouleti* Fairmaire,¹³ of southern and western China, I am reducing *similis* to a subspecies of *pirouleti*, since in structure, general color, punctuation, elytral tuberculation, and bristle arrangement, there is almost perfect identity. There is some possibility that *similis* might be the female of *macrospilus*, but the markings of the latter are of a different nature, the elytral surfaces are smoother and more metallic, lacking basal nodes and black bristles; these differences are almost too great to be of a sexual character in this genus.

¹³ Ann. Soc. Ent. France (6) 9 (1889) 66, Kouï-Tcheou.

Genus ARISTOBIA Thomson

Aristobia THOMSON, Physis 2 (1868) 178; LACORDAIRE, Gen. Col. 9 (1889) 301, 327.

Eunithera PASCOE, Ann. & Mag. Nat. Hist. (4) 15 (1875) 65.

Frons higher than wide, broadened above; antennal insertions strongly divergent; inferior lobes of eyes deeper than wide; antennæ only slightly longer than body in both sexes, generally with third segment, and often some of following segments, with tufts of hairs or bristles at apices; cicatrix of antennal scape fairly well enclosed; prothorax large, transverse, with strong tubercles, disc convex, slightly irregular; elytra broad, subparallel, rounded-emarginate apically. Body largely pubescent.

Genotype.—*Cerosterna hispida* Saunders.

Range.—Oriental Region.

Key to the Hainan species of Aristobia.

Dorsal surfaces dark brown, with many small spots formed of black or whitish hairs; third antennal segment lacking an apical tuft of hairs *hispida*.

Dorsal surfaces bright orange, marked with black reticulations; third antennal segment with a prominent black tuft of hairs at apex.

testudo.

ARISTOBIA HISPIDA (Saunders).

Cerosterna hispida SAUNDERS, Trans. Ent. Soc. London (2) 2 (1853) 112, pl. 4, fig. 6, North China.

Aristobia hispida THOMSON, Physis 2 (1868) 178; LIU, Lingnan Sci. Journ. 13 (1934) 641.

Female.—Body dark reddish brown; head, scape, prothorax, and legs clothed with reddish brown and dotted with black; elytra and ventral surfaces clothed with red-brown pubescence, interrupted by small spots consisting of areas of dense, black pubescence, and smaller spots of grayish-white hairs; antennæ rust-brown to buffy distally, with apices of segments blackish; dorsal surfaces with long, suberect, black hairs; ventral surfaces with shorter, more oblique, black hairs.

Head nearly impunctate; antennæ slightly longer than body, scape thick, slightly longer than third segment, fourth to tenth segments gradually diminishing in length; prothorax broader than long, acutely spined at each side, strongly swollen and nodose on disc; elytra broad, rounded apically and briefly truncate next to suture, their surfaces sparsely punctured; ventral surfaces hardly punctured.

Length, 29 millimeters; breadth, 11.3.

A single female, in the Lingnan Natural History Museum, was taken at Loh-ma-chuen, southwest of Nodoo, altitude 180 meters, August 10, 1929, by the Lingnan University Fifth Hainan Island Expedition.

Distribution.—Eastern China; Formosa; Hainan; Tonkin.

ARISTOBIA TESTUDO (Voet).

Cerambyx testudo VOET, Cat. Col. 2 (1778) 12, pl. 10, fig. 39, China.

Lamia reticulator FABRICIUS, Spec. Ins. 1 (1781) 219.

Cerambyx reticulator DONOVAN, Ins. China (1798) pl. 6.

Aristobia reticulator LACORDAIRE, Gen. Col. 9 (1869) 327.

Aristobia testudo AURIVILLIUS, Col. Cat. 73 (1922) 110; GRESSITT, Lingnan Sci. Journ. 18 (1939) 57.

Female.—Large, rather broad, subcylindrical. Body black, largely clothed with thick, orange-yellow pubescence with black reticulations on dorsal surfaces: head with velvety-black pubescence except for some orange on occiput; antennæ bright orange except for scape, second segment, and bases and apices of third and fourth segments and hair tufts: a large tuft on apical two-fifths of third segment, and a small tuft at apex of fourth segment; prothorax orange-yellow above, except for apices of tubercles and a pair of incomplete longitudinal stripes on disc; scutellum orange-yellow, elytra clothed with same, but with large, partially broken, reticulate markings of black pubescence; ventral surfaces black, clothed with grayish-yellow pubescence; legs black. Dorsal and ventral surfaces clothed with fine, erect hairs.

Head deep, with long mandibles and a convex, sparsely punctured frons; antennæ one and one-sixth as long as body; prothorax with subacute lateral tubercles, disc convex, asperate-punctate on an oblique ridge on each side behind middle; elytra narrowed in posterior third, briefly emarginate-punctate at apices.

Length, 33 to 34 millimeters; breadth, 13.

Five specimens, in the Lingnan Natural History Museum, were taken in groves 1 to 2 miles south of Nodoo, Hainan, June 27 to July 13, 1929; by the Lingnan Univ. Fifth Hainan Exped.; Naam-fung, June 27 and 28, 1932, O. K. Lau and F. K. To; and Faan-a, July 10 and 11, 1932, F. K. To; 1 female was taken by the author at Nodoo, May 31, 1935.

New to Hainan.

Distribution.—South China; Hainan Island.

These specimens differ slightly from the typical continental form, being larger and having less distinct reticulations, and may prove to be a subspecies.

Genus **BLEPEPHÆUS** Pascoe

Blepephæus PASCOE, Proc. Zool. Soc. London (1866) 249; Trans. Ent. Soc. London (3) 3 (1866) 291; LACORDAIRE, Gen. Col. 9 (1869) 339.

Head strongly concave between antennal insertions; frons broader above; inferior eye lobes deeper than wide; antennæ one and one-half to two times as long as body in male, a little longer than body in female; scape subcylindrical, completely cicatricized; prothorax transverse, strongly toothed laterally, uneven above; elytra moderately broad, subparallel, rounded or truncate apically, slightly swollen near base; anterior coxal cavities closed behind; mesosternal intercoxal process subtuberculate, obtusely carinate horizontally; middle tibiæ grooved externally.

Genotype.—*Monohammus succinator* Chevrolat.

Range.—Southeastern continental Asia; Hainan; Formosa.

Key to the Hainan species of Blepephæus.

1. Elytra truncate or emarginate apically..... 2.
Elytra rounded apically *variegatus*.
2. Elytra subemarginate-truncate apically, with external angles toothed;
prothoracic tubercles slightly recurved..... *subcruciatus*.
Elytral apices narrowly emarginate near suture, rounded externally;
prothoracic tubercles short, not curved..... *succinator*.

BLEPEPHÆUS SUBCRUCIATUS (White). Plate 3, fig. 8.

Monohammus subcruciatus WHITE, Proc. Zool. Soc. London 26 (1858) 410, Hongkong.

Blepephæus subcruciatus AURIVILLIUS, Col. Cat. 73 (1922) 114; GRESSITT, Lingnan Sci. Journ. 18 (1939) 59.

Male.—Dark brown, elytra reddish brown; entire surface densely clothed with pubescence: largely reddish fawn above, with a grayish-white Y-shaped figure on elytra; scutellum whitish; head, antennæ, ventral surfaces, and legs grayish fawn; antennæ slightly reddish beyond bases.

Moderately elongate, narrowed posteriorly. Head laterally compressed, eyes weakly convex, frons broader above, antennal supports fairly prominent, divergent; antennæ one and three-fourths as long as body, scape subcylindrical, three-fourths as long as third segment, third to tenth segments gradually shorter; prothorax broader than long, strongly spined laterally, its disc with six weak swellings in two transverse rows, and some irregular, deep punctures; scutellum triangular; elytra long, narrowed, their apices subemarginate-truncate, outer angles slightly more produced, surfaces irregularly punctured; abdomen sparsely punctured.

Length, 17 millimeters; breadth, 5.7.

Female.—Antennæ one and one-fourth as long as body; scutellum less triangular; elytra subparallel to apical third; last abdominal segment broadly truncated.

Length, 19.5 millimeters; breadth, 6.5.

One male specimen was collected at Sam-a, Southern Hainan, April 30, 1936, by G. Ros, and is in his collection; 1 female, in the author's collection, was taken by the author at Dwa-Bi (Tainpin-ts'uen), central Hainan, July 23, 1935, at night on a cut branch of a tree.

Distribution.—Hongkong; Hainan.

BLEPEPHÆUS SUCCINCTOR (Chevrolat).

Monohammus succinctor CHEVROLAT, Rev. Zool. (2) 4 (1852) 417, Shanghai.

Monohammus sublineatus WHITE, Proc. Zool. Soc. London 26 (1858) 410, Sylhet.

Monohammus obfuscatus WHITE, tom. cit. 411, Hongkong.

Blepephæus succinctor PASCOE, Trans. Ent. Soc. London (3) 3 (1866) 250; Trans. Ent. Soc. London (3) 3 (1866) 292; GRESSITT, Lingnan Sci. Journ. 18 (1939) 59.

Brownish black, densely clothed with grayish-brown pubescence on head, scape, and prothorax; third and following antennal segments gray basally and dull brown apically; pronotal disc nearly black along each side and grayish white along postmedian portion; elytra largely whitish gray, finely spotted or streaked with brown, each with a large blackish-brown spot near scutellum, and a variable, sublateral area of similar color just behind middle, a small dark spot on each humerus, and some fine dots at beginning of apical fifth.

Inferior eye lobes one and one-half times as deep as wide; antennæ one and one-half times as long as body in male, one and one-third as long in female, third segment hardly longer than scape; prothorax strongly tuberculate laterally; disc with a swelling at each side before middle and one on middle behind center; elytral apices rounded externally, slightly emarginate near suture.

Length, 19 to 25 millimeters; breadth, 7 to 9.

Several specimens, in the Lingnan Natural History Museum and the author's collection, were taken at Nodoa, Tan District, Hainan, June 27, 1929; April, and June 4 to 10, 1932, by F. K. To.

New to Hainan Island.

Distribution.—South China; Hongkong; Formosa; Hainan; Tonkin; Assam; Tenasserim; India; Siam; Malacca.

BLEPEPHÆUS VARIEGATUS Gressitt sp. nov.

Male.—Dark reddish brown to blackish brown; almost entirely clothed with pubescence as follows: head, antennæ, ventral surfaces, and legs evenly clothed with grayish-tawny pubescence; prothorax similarly clothed, with three lighter, narrow, longitudinal stripes, one median, the other two placed above lateral tubercles; scutellum tawny; elytra brown, varied with grayish white, brown areas consisting of an irregular basal triangle, a broad V at middle and some irregular, subconfluent spots on apical third, the remainder consisting of a broad, sub-basal V, an irregular spot at each side behind middle, and some irregular spots on apical third, confluent along suture.

Head short, narrowly concave between antennal tubercles, longitudinally grooved, nearly impunctate; frons parallel-sided to bases of antennal tubercles, higher than wide, feebly convex; eyes deeply emarginate, inferior lobes one and one-half times as deep as wide, extending two-thirds distance from antennal insertions to bases of mandibles. Antennæ two and two-thirds times as long as body, gradually attenuated beyond scape; scape subcylindrical, widely cicatricized, three-fifths as long as third segment; fourth to seventh segments subequal, each three-fourths as long as third; seventh segment nearly as long as following two united. Prothorax a little broader than long, subacutely tuberculate laterally; disc with two swellings on each side and one on middle behind center, several large, but low, glabrous granules behind middle. Scutellum rounded behind. Elytra a little more than twice as long as broad, narrowed and obtusely rounded apically; surface subseriately punctured, punctures subasperate basally, fine and sparse apically. Ventral surfaces micropunctulate; first hind tarsal segment nearly as long as following two segments united.

Length, 17.5 millimeters; breadth, 5.7.

Holotype, male, in the Lingnan Natural History Museum, Taipin-ts'uen (Dwa-Bi), near Loi Mother Mountain, central Hainan, altitude 400 meters, July 24, 1935, by F. K. To.

Similar to *B. subcruciatu*s (White), but with the frons narrower, the vertex more acutely concave between antennal tubercles, the scape relatively shorter, the seventh antennal segment nearly twice as long as the eighth, the prothorax with the disc less swollen and the lateral tubercles not curved, the elytra apically rounded instead of truncate, and the pattern consisting of a brown V, edged with gray at middle, instead of a gray-brown X.

Distribution.—Hainan Island.

Genus HAINANHAMMUS Gressitt novum

Head about as wide as base of prothorax; frons convex, higher than wide, broader above than below; antennal supports large, prominent, divergent; vertex obtusely but rather deeply concave; eyes subfinely faceted, emarginate, with inferior lobes nearly twice as deep as wide; antennæ about twice as long as body (male); scape subcylindrical, nearly as long as third segment, narrowly and indistinctly cicatricized distally; prothorax subtransverse, tuberculate laterally; elytra narrowed, rounded posteriorly; mesosternal intercoxal process tuberculate-carinate; anterior tarsi not very broad, shorter than tibiæ.

Genotype.—*Hainanhammus griseopubens* Gressitt sp. nov.

Range.—Hainan Island.

This genus differs from *Blepephæus* in being shorter, with the antennal scape long and with a very small, glabrous cicatrix; it can be distinguished from *Melanauster* by the horizontal keel on the mesosternal process, the long, slender scape, and the small cicatrix.

HAINANHAMMUS GRISEOPUBENS Gressitt sp. nov. Plate 4, fig. 1.

Male.—Body dull reddish brown, blackish on scape, apical antennal segments, swollen portions of pronotum, elytral discs, and legs; surfaces clothed with thin, gray pubescence, very sparsely on antennæ, beyond scape, and irregularly on elytra; scutellum apically with pale tawny hairs; antennæ almost lacking erect hairs beneath.

Head almost impunctate, only a few small punctures above center of frons; mandibles short, strongly curved; frons convex, shallowly grooved along median line; vertex angularly concave; inferior eye lobes occupying three-fourths distance between antennal insertions and genal margins. Antennæ twice as long as body; scape hardly swollen, truncate and feebly cicatricized apically; subequal to third, fourth, and fifth segments, respectively; following segments decreasing slightly in length. Prothorax a little broader than long, a stout, posteriorly somewhat curved tubercle just behind middle of each side; disc swollen along midline at center, and on each side before middle sparsely and irregularly punctured. Scutellum short, rounded behind. Elytra barely twice as long as head and prothorax combined, distinctly narrowed, separately rounded posteriorly; surfaces distinctly and irregularly punctured, punctures becoming very fine towards apices. Ventral surfaces not distinctly punctured. Posterior femora reaching to end of third abdominal segment. Tarsi nar-

row, first segment of hind pair as long as following two segments combined.

Length, 10.6 to 12 millimeters; breadth, 3.5 to 4.2.

Holotype, male, in the Lingnan Natural History Museum, Namcha-chuen, 5 kilometers west of Nodoa, westcentral Hainan Island, altitude 180 meters, July 6, 1929, Lingnan Univ. Fifth Hainan Exped.; paratype, male, in the author's collection, Dwa-Bi (Tai-pin-ts'uen), near Loi Mother Mountain, altitude 400 meters, July 28, 1935, taken by the author; paratype, male, in the United States National Museum, near Fooi-ju, northwest of Nodoa, August 20, 1929, Lingnan Univ. Fifth Hainan Exped.

Somewhat similar in appearance to a small species of *Melan-auster*, but differing in lacking pubescent spots and in having the mesosternal process with a horizontal keel and the antennal scape slenderer and with a smaller cicatrix.

Distribution.—Hainan Island.

AGNIINI

AGNIITES Thomson, Syst. Cer. (1864) 83, 382.

HYPSELOMINÆ Pascoe, Trans. Ent. Soc. London (3) 3 (1866) 227, part.

AGNIIDES Lacordaire, Gen. Col. 9 (1869) 340.

AGNIINI Aurivillius, Col. Cat. 73 (1922) 118.

Frons much higher than wide, narrowed above; eyes finely faceted; antennal supports subadjacent; antennæ long; scape slender, with a closed apical cicatrix; elytra several times as long as head and prothorax combined; middle coxal cavities open externally to epimera; middle tibiæ grooved externally; tarsal claws divaricate.

Genus PHARSALIA Thomson

Pharsalia THOMSON, Syst. Cer. (1864) 85, 384; PASCOE, Trans. Ent. Soc. London (3) 3 (1866) 228, 248; LACORDAIRE, Gen. Col. 9 (1869) 342, 347.

Antennal supports vertical, nearly touching, acutely prominent internally; inferior eye lobes about as wide as deep; antennæ three to three and one-half times as long as body in male, about twice as long as body in female; prothorax broader than long, strongly tuberculate laterally; elytra long, rounded apically, tuberculate at base near scutellum; middle intercoxal process tuberculate anteriorly; posterior femora little more than one-half as long as abdomen.

Genotype.—*Pharsalia malasiaca* Thomson.

Range.—Oriental Region.

PHARSALIA FERRUGINEA Gahan.

Pharsalia ferruginea GAHAN, Journ. Fed. Malay States Mus. 1 (1906) 116, pl. 6, fig. 11, Selangor, Malacca; Siamese Malay States.

Female.—Elongate, subelliptical in dorsal outline. Body black, reddish brown along margins of abdominal segments and on tibiae and tarsi, largely clothed with rusty brown, black, and yellowish-white pubescence: head rusty with three narrow black streaks on occiput; antennae rusty to base of third segment, fourth and following segments thinly clothed with grayish at bases; prothorax with five dorsal stripes, and one stripe on lower part of each side, of rusty pubescence; scutellum rusty; elytra with a suturally interrupted, transverse, yellowish-white band just before middle, edged before and behind with black, bases and apices mottled and streaked with rusty; ventral surfaces clothed with paler ferrugineous, subglabrous along middle and sides of abdominal sternites; legs clothed with rusty brown.

Head narrowed in front; frons impunctate, finely carinate medially; vertex narrowly and acutely concave. Antennae twice as long as body; scape slender, subcylindrical. Prothorax nearly twice as broad as long, acutely tuberculate laterally; disc uneven, with a small, low tubercle behind center. Elytra narrowed and rounded-truncate apically; bases rounded-tuberculate; surfaces subseriate-punctate.

Length, 18 millimeters; breadth, 6.8.

A single female, in the Lingnan Natural History Museum, was taken at Sam-kwong-ts'uen, Lam-wan-tung, Kiung-shan District, August 13 and 14, 1935, by F. K. To.

New to Hainan Island.

Distribution.—Malacca; lower Siam; Hainan.

BATOCERINI

BATOCERIDES Lacordaire, Gen. Col. 9 (1869) 353.

BATOCERA group Gahan, Ann. & Mag. Nat. Hist. (6) 1 (1888) 279.

BATOCERINI Aurivillius, Col. Cat. 73 (1922) 123.

Cicatrix of antennal scape open; head not touching anterior coxae in repose; eyes finely faceted; antennal tubercles low, widely divergent; prothorax strongly tuberculate laterally; mesosternal process variable, generally nontuberculate.

Key to the Hainan genera of Batocerini.

Antennae rough, asperate beneath..... *Batocera*.

Antennae not distinctly roughened, lacking small tubercles on undersides.

Apriona.

Genus BATOCERA Castelnau

Batocera CASTELNAU, Hist. Nat. Col. 2 (1840) 470; THOMPSON, Syst. Cer. (1864) 74, 378; KRIESCHE, Archiv. f. Naturg. A 11 80 (1915) 111.

Key to the Hainan species of Batocera.

1. External angles of elytral apices briefly toothed; each elytron with not more than four large, white spots, and two or three small spots, ground color black or dark brown, with gray or gray-green pilosity; occiput even 2.
- External angles of elytral apices rounded; each elytron with a number of irregularly placed tawny-orange spots, ground color reddish brown, with fulvous pilosity; occiput subrugulose.... *rufomaculata*.
2. Antennal segments with strong, acuminate internal and apical teeth; each elytron with four large, rounded, white spots in a longitudinal row; prothorax narrower than elytra at humeral spines. *roylei orientalis*.
- Antennal segments with only a few, small, blunt or strongly oblique teeth on inner faces, except at apices of distal segments; major elytral spots irregular in size, second spot largest, with at least one accessory spot; prothorax as broad as elytra at humeral spines. *rubus*.

BATOCERA ROYLEI ORIENTALIS Kriesche.

Batocera roylei orientalis KRIESCHE, Archiv. Naturg. 11 A 80 (1915) 119, Tonkin.

Male.—Large, elongate, slightly narrowed posteriorly. Body black, clothed thinly above and densely beneath, with velvety gray-brown pubescence, except for following white markings: a wide subreniform spot on each side of middle of pronotal disc, almost entire surface of scutellum; four large, rounded spots in a row along middle of each elytron; and a broad stripe along each side of body from behind eye to base of last antennal segment.

Antennæ one and one-half times as long as body, armed internally with many acute spines, these spines larger at apices of segments; prothorax with slender-tipped lateral spines; elytra densely nodose basally, punctures beyond base hardly visible to naked eyes.

Length, 51 millimeters; breadth, 17.5.

A single male, in the Lingnan Natural History Museum, was taken at Tai-pin-ts'uen (Dwa-Bi), near Loi Mother Mountain, central Hainan, May 17 and 18, 1935, by F. K. To.

New to Hainan Island.

Distribution.—Tonkin; Hainan.

BATOCERA RUBUS (Linnæus).

Cerambyx rubus LINNÆUS, Syst. Nat. ed. 10 (1758) 390; ed. 12 (1767) 625.

Lamia rubus FABRICIUS, Syst. Ent. (1775) 177; Syst. Eleuth. 2 (1801) 283.

Cerambyx albofasciatus DE GEER, Mem. Ins. 5 (1775) 106, pl. 13, fig. 16.

Lamia octomaculata FABRICIUS, Ent. Syst. (1) 2 (1792) 290.

Batocera octomaculata PASCOE, Trans. Ent. Soc. London (3) 3 (1866) 262.

Batocera rubus AURIVILLIUS, Col. Cat. 73 (1922) 126.

Male.—Moderately large, broad at humeri, distinctly narrowed posteriorly. Body brownish black; elytra and apical three-fourths of antennæ dark reddish brown; body thinly clothed with a dull grayish-brown pilosity, and marked with areas of dense pale pubescence as follows: a pair of () shaped orange-yellow marks around center of pronotal disc, scutellum clothed with white, each elytron with three major white spots, second spot with some adjacent blotches, side of body with a broad stripe from behind eye to end of last abdominal segment.

Antennæ one and one-half times as long as body, briefly and sparsely tuberculate internally; prothorax short, sharply tuberculate; elytra coarsely nodose basally, distinctly punctured in middle portion, apices truncate, briefly dentate at angles.

Length, 38 millimeters; breadth, 13.7.

A male was taken by the writer at Kachek, eastern Hainan, altitude 25 meters, August 8, 1935. Specimens are in the Lingnan Natural History Museum from Cheung-kon-ts'uen, April 1 to 3, 1935; Sam-kwong-ts'uen, August 12, 1935; Tai-pin-ts'uen, May and July, 1935; Nam-liu-tin, Kiung-shan District, August, and Nam-po-ts'uen, Chieng-mai District, September 1 to 3, 1935, F. K. To; and Nodoo, August 15, 1929, Lingnan Univ. Fifth Hainan Exped.

New to Hainan.

Distribution.—India; Assam; Peninsula of southeastern Asia; Sunda Islands; Philippines; South China; Hainan; Formosa; Korea.

BATOCERA RUFOMACULATA (De Geer).

Cerambyx rufomaculata DE GEER, Mem. Ins. 5 (1775) 107.

Cerambyx cruentata GMELIN, in Linnæus, Syst. Nat. ed. 13 (1) 4 (1790) 1863.

Cerambyx rubiginosa VOET, Cat. Col. 2 (1778) 14, pl. 13, fig. 53.

Cerambyx rubus SCHRÖTER, Abhandl. 1 (1776) 333, pl. 2, fig. 2; DONOVAN, Ins. China (1798) pl. 6, fig. 1.

Batocera rubus THOMSON, Arcana Nat. (1859) 80.

Batocera rufomaculata AURIVILLIUS, Col. Cat. 73 (1922) 127.

Male.—Large, broad-shouldered, narrowed posteriorly. Body brownish black, elytra, apical two-thirds of antennæ, and legs reddish brown; surfaces largely clothed with thin pile: gray-brown on head, prothorax, and antennæ, very sparse on latter, buffy on elytra, pale tawny on ventral surfaces and legs; marked with areas of thick pubescence as follows: a crescent orange spot on each side of center of pronotum, scutellum entirely covered with creamy pubescence, each elytron marked with about five fairly distinct, rounded, pale-orange spots of decreasing size in a zig-zag arrangement on disc, besides a few irregular smaller spots, and a broad creamy stripe along each side of lower portions from side of neck to last abdominal segment, with a rounded projection on each side of metasternum.

Antennæ nearly one and one-half as long as body, coarsely rugulose on basal segments, and armed with many sharp spines internally; prothorax transverse, acutely spined laterally, not quite as broad as elytral bases, rugose at sides of pronotal disc; elytra coarsely nodose basally, indistinctly punctured in middle.

Length, 52 millimeters; breadth, 17.

Description based on a specimen from northern India.

One specimen, in the Musée Heude, considered referable to this species, was collected on Hainan in the spring of 1936 by Commander G. Ros; and 1 specimen, in the Lingnan Natural History Museum, Tai-pin-ts'uen, July 1935, F. K. To.

New to Hainan.

Distribution.—India; Andamans; Ceylon; Cochin-China; Hainan; Tibet; Madagascar; Mauritius; Bourbon; East Africa.

Genus APRIONA Chevrolat

Apriona CHEVROLAT, Revue Zool. (2) 4 (1852) 414; PASCOE, Trans. Ent. Soc. London (3) 3 (1866) 259, 272; LACORDAIRE, Gen. Col. 9 (1869) 354, 356.

Subcylindrical; eyes large; frons higher than wide; antennæ a little longer than body in male and a little shorter in female, neither wrinkled nor bearing spines; prothorax short, strongly spined, rugose; elytra nodose or asperate-punctate basally, narrowly emarginate-truncate apically; mesosternal process even.

Genotype.—*Lamia germari* Hope.

Range.—Oriental Region; Philippines; Celebes.

Key to the Hainan species of Apriona.

- Pronotum transversely ridged; elytral bases nodose with small punctures; antennæ black with bases of third and following segments grayish white; elytra brownish green with black nodes and blue-gray margins *germari*.
 Pronotum coarsely vermiculose; elytral bases deeply asperate-punctate; antennæ greenish-brown basally and dark brown apically; elytra speckled with white *swainsoni*.

APRIONA GERMARI (Hope).

Lamia Germari HOPE in Gray, Zool. Miscell. 1 (1831) 28, Silhet.

Apriona rugicollis CHEVROLAT, Revue Zool. (2) 4 (1852) 418, Shanghai.

Apriona Germari STEBBING, Ins. affect. Forestry 1 (1903) 25, pl. 4, fig. 3c; GRESSITT, Lingnan Sci. Journ. 18 (1939) 61.

Black, largely clothed with greenish-brown pubescence; antennæ with bases of third and following segments clothed with dense grayish-white pubescence; pronotum with ridges, asperate punctures, and upper parts of lateral tubercles subglabrous; elytra with basal nodes shiny black, suture and external margins clothed with bluish-gray pubescence; legs with sparse, grayish-tawny pubescence.

Head broad, impressed with punctures of two sizes; frons constricted; vertex broadly concave; antennæ slightly longer than body, segments unarmed, cylindrical, finely punctulate; prothorax transversely corrugated, sharply spined; elytra even except for low glabrous nodes at bases, their apices narrowly and obliquely truncate and bidentate.

Length, 30 millimeters; breadth, 12.5.

Specimens are in the Lingnan Natural History Museum from Sam-kwong-ts'uen (Lam-wan-tung, Loi territory), August 7 to 9, 1932, F. K. To; Kachek, May 1932, Nodoa, June 27, 1929, Lingnan Univ. Fifth Hainan Exped.; and Nai-suen, September 1 to 10, 1932.

New to Hainan.

Distribution.—India; Burma; Indo-China; central and southern China; Hainan; Formosa; Ryu Kiu Islands; Japan.

APRIONA SWAINSONI (Hope).

Lamia swainsoni HOPE, Proc. Linn. Soc. London 1 (1840) 79, Assam.

Apriona basicornis FAIRMAIRE, Ann. Soc. ent. Belg. 39 (1895) 185, Tonkin.

Apriona swainsoni AURIVILLIUS, Col. Cat. 73 (1922) 132.

Male.—Moderately large, elongate, hardly narrowed posteriorly. Body dark brown, head and prothorax nearly black, elytra and legs dark reddish brown, labrum red; surfaces clothed with pubescence of various colors and thicknesses: head and prothorax with sparse, grayish-tawny pubescence; antennæ with close, tawny pubescence to just beyond middle of fourth segment, and with dull golden-brown on remainder; scutellum and extreme bases of elytra with dense, tawny-orange pubescence; remainder of elytra with thin, close, grayish-brown to buffy, mixed with thicker, white, pubescence, the latter mainly concentrated in small irregular spots scattered over entire surface; ventral surfaces clothed with tawny-brown, marked on sides of thoracic and abdominal segments with white pubescence.

Head large, an arcuate groove across lower portion of frons, two sizes of punctures, some asperate punctures around upper lobes of eyes, and frons greatly constricted by eyes; antennæ one and one-sixth as long as body, segments subcylindrical, third and fourth segments distinctly swollen apically, following segments subangulate ectoapically; prothorax grossly vermiculate-rugose, with two transverse ridges at both apex and base; elytra asperate-punctate basally, shallowly punctured on remainder, subtransversely truncate and bidentate apically.

Length, 32 to 33 millimeters; breadth, 10.5.

Female.—Antennæ not quite reaching to elytral apices; body very stout.

Length, 38 to 39 millimeters; breadth, 12.6 to 13.

Several specimens, in Lingnan Natural History Museum and in the author's collection, Lam-ko, Lin-kao District, May 23 to 25, Nam-fung, July 5 and 6, and Faan-na, 9 miles south of Nodda, July 10 and 11, 1932, F. K. To; 1 female was taken for the author at Hoihow, July 1935, by Miss Betty Steiner; 1 male is in the British Museum, labelled "Hainan Island, Fry coll., 1905. 100".

New to Hainan Island.

Distribution.—Assam; Tonkin; Hainan.

MESOSINI

MESOSITÆ Thomson, Calssif. Cer. (1860) 35, part; Syst. Cer. (1864) 58, part.

MESOSINÆ Pascoe, Trans. Ent. Soc. London (3) 3 (1866), 7, 94, part.

MESOSIDES Lacordaire, Gen. Col. 9 (1869) 367.

MESOSINI Aurivillius, Col. Cat. 73 (1922) 135.

Antennal scape with an open cicatrix; head capable of touching anterior coxæ in repose; antennæ ciliate beneath, rarely as

much as twice as long as body; anterior coxal cavities angulate externally; middle coxal cavities open externally to epimera; middle tibiæ lacking a distinct external groove.

Key to the Hainan genera of Mesosini.

1. Eyes deeply emarginate 2.
 Eyes divided into two lobes connected by a narrow strand..... 4.
2. Third and fourth antennal segments not very long, not bearing tufts of hairs apically 3.
 Third and fourth antennal segments long, both bearing tufts of hairs apically *Cacia*.
3. Antennæ slender, considerably longer than body in male; fourth segment very slightly longer than fifth segment; middle intercoxal process tuberculate or at least vertical anteriorly..... *Mesocacia*.
 Antennæ stout, very little longer than body in male; fourth segment about as long as fifth and sixth segments combined; middle intercoxal process rounded and gradually declivitous anteriorly.... *Falsomesosella*.
4. Sides of prothorax more or less rounded, bluntly swollen or nearly straight 5.
 Sides of prothorax with a small but distinct tubercle before middle.

Coptops.

5. Vertex distinctly concave between antennal insertions; pronotum somewhat uneven; middle intercoxal process subtuberculate anteriorly.

Mesosa.

Vertex horizontal between antennal insertions; pronotum smooth, evenly convex; middle intercoxal process broad and convex at anterior margin of vertical declivity, plane on ventral surface.... *Chæromorpha*.

Genus MESOSA Latreille

Mesosa LATREILLE in Cuvier, Regne Anim. Ins. ed. (2) 2 (1829) 124;

SERVILLE, Ann. Soc. ent. France 4 (1835) 43; THOMSON, Syst. Cer. (1864) 370; LACORDAIRE, Gen. Col. 9 (1869) 369, 372.

Aplocnemia STEPHENS, Brit. Ent. Mand. 4 (1873) 236.

Haplocnemia GEMMINGER and HAROLD, Cat. Col. 10 (1873) 3038; REITTER, Fauna Germ. 4 (1912) 62.

Vertex moderately concave between antennal insertions; frons squarish; eyes divided into two lobes connected by a fine thread, inferior lobe wider than deep; antennæ a little longer than body in male, about as long as body in female; prothorax a little broader than long, with low convexities on notal disc and sides; elytra subparallel; middle intercoxal process uneven, subtuberculate anteriorly.

Genotype.—*Lamia curculionoides* Fabricius.

Range.—Palæarctic and Oriental Regions.

MESOSA MACULIFEMORATA Gressitt sp. nov. Plate 3, fig. 5.

Male.—Moderately large, subparallel, broadly rounded posteriorly. Body dark reddish brown to blackish brown, almost entirely clothed with varied patterns of grayish-white, light-brown, and dark-brown pubescence, and subglabrous areas: head largely clothed with tawny-brown in front, spotted with dark brown, and spotted with whitish on genæ, behind eyes, and on occiput, a pair of longitudinal subglabrous dark-brown stripes on latter; antennæ irregularly clothed with tawny-gray on scape, basally tawny to whitish and apically brownish black, on following segments; prothorax clothed with grayish white and buff, finely clothed with dark brown and with a longitudinal, subglabrous stripe of same color on each side of notum, from apex to base; scutellum whitish along middle, glabrous at sides; elytra clothed with light brown with irregular areas of grayish white, the latter largely forming zig-zag transverse bands and narrower longitudinal stripes, besides three incomplete, strongly zig-zag, subglabrous bands, two subbasal spots, and numerous small dots, of dark chocolate-brown; ventral surfaces clothed with grayish white except for irregular areas and small spots on sides, and median portion of abdominal sternites dark brown; legs tawny-white, irregularly spotted on femora, ringed subbasally and apically on tibiæ, with blackish brown. Body almost entirely clothed with sparse, erect hairs, blackish brown on dorsal surfaces of body and undersides of antennæ, tawny on ventral surfaces of body.

Head sparsely punctured, broadly concave between antennal insertions, inferior eye lobes reaching one-half distance from antennal bases to genal margins. Antennæ nearly one and one-fourth as long as body; scape gradually thickened apically, nearly as long as third segment; third to sixth segments proportionately reduced in length. Prothorax moderately convex laterally; disc with a large swelling on each side of middle and a small swelling on midline near base; surface irregularly punctured. Scutellum short, truncate behind. Elytra conjointly rounded posteriorly; somewhat coarsely punctured basally, less so posteriorly; ventral surfaces shallowly punctured.

Holotype, length, 20 millimeters; breadth, 7.6.

Paratypes, length, 14.5 to 16.5 millimeters; breadth, 5.6 to 6.4.

Female.—Antennæ barely as long as body, last abdominal sternite longer than two preceding, medially sulcate.

Length, 16.5 to 20.5 millimeters; breadth, 7 to 8.

Holotype, male, in the Lingnan Natural History Museum, Tai-pin-ts'uen (Dwa-Bi), near Lai-mo-ling, Loi Mother Mountain, Kiung-shan District, central Hainan, May 1 to 4, 1935, F. K. To; allotype, female, Nos. 53456 and 53459 United States National Museum, Sam-ts'uen-kai-hui, southeast of Lai-mo-ling, Ting-an District, June 27 to 30, 1935, F. K. To; paratopotype male, in the author's collection, taken July 24, 1935, by the author; additional paratypes, in the Lingnan Natural History Museum, San-ts'uen-kai-hui, June 27 to 30, villages at foot of Lai-mo-ling, May 25, Sam-kwong-ts'uen, August 13, and Nam-liu-tin, July 13, 1935, F. K. To.

Differs from *M. pæcila* Bates in being darker, with more brown and black pubescence, and with erect body hairs much shorter. Possibly related to *M. nigrosparsa* Pic, of Indo-China.

Distribution.—Hainan Islands.

Genus MESOCACIA Heller

Mesocacia HELLER, Tijds. Ent. 69 (1926) 33.

Frons higher than wide, subrectangular, plane; vertex feebly concave; inferior eye lobes generally wider than deep; antennæ considerably longer than body in female; scape long, gradually thickened towards apex; third and following antennal segments decreasing gradually in length; prothorax about as long as broad, nontuberculate above; mesosternal process tuberculate.

Genotype.—*Mesocacia assamensis* Heller.

Range.—Assam; Hainan Island.

Key to the Hainan species of *Mesocacia*.

1. Antennæ nearly twice as long as body in female, at least twice as long as body in male; frons distinctly deeper than wide..... 2.
Antennæ only slightly longer than body in female; frons about as broad as deep, trapeziform; genal angles very prominent; antennæ with erect hairs internally; pronotal disc transversely rugose. *rugicollis*.
2. Inferior eye lobes deeper than wide; prothorax one-third broader than long, unevenly convex on each side of notum; elytra clothed with dark-brown and grayish-white pubescence..... *punctifasciata*.
Inferior eye lobes wider than deep; prothorax nearly as long as broad, evenly convex on each side of notum; elytra clothed with tawny-sulphur, mottled with gray-brown and black..... *assamensis*.

MESOCACIA ASSAMENSIS Heller. Plate 3, fig. 6; Plate 7, fig. 1.

Mesocacia assamensis HELLER, Tijds. Ent. 69 (1926) 33, Assam.

Male.—Brownish black, partly dark reddish brown beneath; almost entirely clothed with close pubescence, largely tawny-

yellow mottled with darker shades: head with tawny-sulphur-yellow along middle of anterior and dorsal surfaces, along each side below eyes, on sides of neck, and narrowly along each side of frons; antennæ thinly clothed with greenish yellow on inner side of scape and with grayish white on basal third or quarter of each of third and following antennal segments; prothorax tawny-yellow, with an irregular black stripe on each side of disc from apex to base, another, less distinct, gray-brown stripe on each side, internal to, and partly in contact with, the former; scutellum and elytra clothed with tawny-sulphur-yellow, the latter irregularly marked with dusky brown and velvety black spots, some of these forming a zig-zag band before, and another behind, middle; ventral surfaces tawny-sulphur, a small brown spot on middle of each metepisternum; legs greenish sulphur-yellow, banded with brownish black.

Head finely punctulate; inferior eye lobes wider than deep, occupying less than one-half space between antennal insertions and genal angles. Antennæ nearly two and one-half times as long as body, slender; scape nearly as long as third segment. Prothorax nearly as long as broad, narrowed anteriorly; disc slightly uneven, sparsely punctured. Elytra parallel, rounded apically; surfaces sparsely punctured. Mesosternal process feebly tuberculate.

Length, 14 to 15 millimeters; breadth, 5 to 5.3.

Female.—Pubescence more golden-tawny above and sulphur-yellow beneath. Antennæ not quite twice as long as body.

Length, 14 millimeters; breadth, 5.2.

The Hainan material differs slightly from specimens from Assam, appearing to be somewhat differently marked, but it is mainly a difference in intensity of the coloration, the Hainan specimens being more distinctly marked. In structure they are identical.

One male, in the Lingnan Natural History Museum, was taken at Tai-pin-ts'uen (Dwa-Bi), near Loi Mother Mountain, July 23, 1935, by F. K. To; 1 female, in the author's collection, was taken at the same place by the author July 21; several were taken at Tai-tsing-lam-ts'uen, back of Loi Mother Mountain, June 7 to 10, and 1 at Sam-kwong-ts'uen, August 7 to 9, 1935, by F. K. To.

New to Hainan Island.

Distribution.—Assam; Hainan.

MESOCACIA PUNCTIFASCIATA Gressitt sp. nov. Plate 7, fig. 2.

Female.—Body dark brown, reddish brown on sides of abdominal sternites, blackish on antennæ, irregularly clothed with tawny and dirty-white pubescence; head with small patches of tawny pubescence on edges and middle of frons, borders of eyes, sides of neck, and middle of occiput; antennæ with thin, irregular, tawny pubescence on scape, and grayish pubescence on bases of third and following segments; prothorax thinly clothed with tawny pubescence, except for a number of subglabrous areas and dots, mainly surrounding center of notal disc; scutellum thinly clothed apically; elytra with a wide, irregularly margined, grayish-white band centered slightly before middle, marked with two brown dots on each side, bases dark brown with a few small tawny spots, apices dark brown mixed with golden-brown and marked with irregular tawny-white areas; ventral surfaces clothed with tawny-yellow pubescence with a few small dark-brown spots along side; legs blackish brown, banded with tawny or white on bases and middles of femora and tibiæ and on first two tarsal segments; a few erect bristles on inner sides of basal five antennal segments and on base of pronotum.

Head as broad as prothorax, slightly broader at middle of genæ than at eyes; frons higher than wide, lateral margins slightly zig-zag; vertex broadly concave; punctures sparse and fine on frons, large near genal angles. Antennæ nearly twice as long as body; scape gradually thickened to apex, about as long as third segment; following segments decreasing in length. Prothorax broader than long, slightly rounded at sides, swollen on each side of middle of disc, irregularly punctured behind center and on sides. Elytra slightly narrowed and rounded posteriorly, feebly swollen on each side of suture near base, closely sub-asperate-punctate basally, more sparsely and finely punctured posteriorly.

Length, 13.5 millimeters; breadth, 5.

Holotype, female, in the Lingnan Natural History Museum, Tai-pin-ts'uen, near Loi Mother Mountain, central Hainan, May 1935, F. K. To.

Differs from *M. assamensis* Heller in being broader, with the prothorax transverse, the elytra asperate basally, the dorsal surface largely darker, with a broad, pale, median band.

Distribution.—Hainan Island.

MESOCACIA RUGICOLLIS Gressitt sp. nov. Plate, 7, fig. 3.

Female.—Moderately large; elytra broad; antennæ stout. Body blackish brown to reddish brown, partly clothed with tawny-brown or pinkish pubescence; head with tawny pubescence on genæ, apical portion of frons, and sides of vertex and occiput; antennæ clothed with pinkish tawny on basal halves of third and following segments, apices clothed with black; prothorax brownish black; partly subglabrous, marked with spots of tawny-yellow on center and midbasal portion of notal disc, behind anterior margin and on sides; scutellum reddish, subglabrous; elytra black, reddish brown in part on scutellar half, largely covered with subrounded spots of tawny pubescence, intervening areas sparsely clothed with blackish; ventral surfaces brownish black, reddish brown on parts of metasternum, sides of abdominal sternites, and most of apical segments, clothed with pinkish pubescence on reddish areas, sparsely with grayish brown on darker parts; legs reddish to dark brown, clothed with tawny and pinkish marked with bands of dark brown. Body with only a few erect hairs; antennæ densely clothed with black bristles on inner sides of basal segments.

Head a little broader than prothorax, finely punctulate; frons fully as broad as deep, trapeziform, widest at bottom; genal angles very prominent; eyes deeply emarginate, inferior lobes distinctly transverse. Antennæ one and one-sixth as long as body; scape gradually thickened to apex, fully as long as third segment; third to sixth segments distinctly and regularly decreasing in length and thickness. Prothorax slightly broader than long, narrowed anteriorly, hardly swollen at sides; disc convex on each side of, and behind, center, bearing numerous transverse ridges. Scutellum short, rounded-triangular. Elytra less than twice as long as head and prothorax combined, bluntly rounded posteriorly; disc deeply subasperate-punctate basally, less deeply so towards apices. Prosternal process with a tubercle on each side; mesosternal process strongly tuberculate anteriorly. Last abdominal sternite fully as long as three preceding sternites combined.

Length, 20.5 millimeters; breadth, 7.7.

Holotype, female, in the Lingnan Natural History Museum, Sam-kwong-ts'uen, near Lai-mo-ling, Loi Mother Mountain, central Hainan Island, August 16 to 18, 1935, F. K. To; paratopotype, female, in the author's collection, August 10 and 11.

Differs from *M. assamensis* Heller in having the frons broad and trapeziform, the prothorax stout and transversely rugose, the antennæ barely longer than the body in the female, and in other respects. This species does not fit very well in this genus, and its placement here is only provisional.

Distribution.—Hainan Island.

Genus CACIA Newman

Cacia NEWMAN, Entomologist 1 (1842) 290; THOMSON, Syst. Cer. (1864) 370; PASCOE, Trans. Ent. Soc. London (3) 3 (1865) 96, 106; LACORDAIRE, Gen. Col. 9 (1869) 369, 374.

Corethrophora BLANCHARD, Voy. Pole Sud Zool. 4 (1853) 301.

Ipocregyes PASCOE, Trans. Ent. Soc. London (3) 3 (1866) 113, syn. nov.

Vertex distinctly concave between antennal insertions; frons higher than wide; eyes deeply emarginate, sometimes nearly divided, lobes hardly separated, inferior lobes about as deep as wide; antennæ considerably longer than body in male, slightly longer in female, third and fourth segments generally long and hairy; prothorax feebly rounded laterally, slightly irregular on disc; elytra parallel, rounded apically; middle intercoxal process subtuberculate, vertical anteriorly.

Genotype.—*Cacia spinigera* Newman.

Range.—Oriental Region; Indo-Australian Subregion.

I am synonymizing *Ipocregyes* with *Cacia*, because the differences attributed to the former break down and gradually blend into *Cacia* in certain species described since *Ipocregyes* was proposed. The elytral callosities appear to be no more than a specific character, as do the swollen, instead of tuberculate, mesosternal process and shorter antennæ, with every degree of intergradation exhibited in various species now known or still undescribed. I doubt that Kano's two Formosan species described as *Ipocregyes* belong here.

CACIA NIGROFASCIATA Gressitt sp. nov. Plate 7, fig. 5.

Female.—Small, parallel-sided, rounded posteriorly. Body reddish brown, dark brown, or blackish, clothed with golden, tawny, or brown pile and erect hairs; head blackish brown, clothed with dull tawny pile, reddish and subglabrous at genal angles; antennæ reddish brown, darker on scape and apical half of fourth segment, clothed with thin brown pile, whitish on bases of third and fourth segments and on most of fifth segment, and long, erect, dark-brown hairs, dense and blackish on inner side of apical portion of fourth segment. Prothorax dark

brown, reddish at base, thinly clothed with tawny pile, except for a blackish stripe on each side of notum, extending from basal margin to about middle. Scutellum entirely clothed with tawny. Elytra largely clothed with buff or tawny pile of varying thickness, and two subbasal reddish-brown, subglabrous spots, a large, transverse, blackish-brown, subglabrous spot on each elytron a little behind middle, some small dark-brown dots on apical portions. Ventral surfaces dark brown, orange brown on bases and sides of abdominal segments, clothed with thin, tawny-golden pile. Legs reddish brown with buff pile, paler and denser on middle of tibiae and first two abdominal segments. Body almost entirely clothed with erect hairs.

Head nearly as broad as prothorax, narrower at genal angles than at eyes; frons squarish, finely punctured; inferior eye lobes wider than deep, occupying two-fifths distance from antennal insertions to genal angles. Antennae one and one-fourth as long as body; scape gradually thickened, four-fifths as long as third segment and hardly longer than fourth, which is swollen in apical half and nearly as long as following three segments combined. Prothorax broader than long, slightly swollen laterally, constricted near apex and base; disc fairly even, sparsely punctured. Elytra short, parallel, rounded behind, deeply and irregularly punctured on basal half, more finely so posteriorly. Mesosternal process obtusely tuberculate.

Length, 8 millimeters; breadth, 3.3.

Holotype, female in the Lingnan Natural History Museum, Tai-tsing-lam-ts'uen, back of Lai-mo-ling (Loi Mother Mountain), Ting-an District, Hainan, July 17 and 18, 1935, F. K. To.

Differs from *C. newmani* Pascoe (type of *Ipocregyes*), of Malacca and Borneo, in being larger, in having the elytral bases less swollen, the fourth antennal segment less brushlike, the pronotum not completely striped, and the elytra less distinctly marked, with the postmedian fascia not oblique.

Distribution.—Hainan Island.

Genus COPTOPS Serville

Coptops SERVILLE, Ann. Soc. ent. France 4 (1835) 64; THOMSON, Syst. Cer. (1864) 371; PASCOE, Trans. Ent. Soc. London (3) 3 (1865) 96, 116; LACORDAIRE, Gen. Col. 9 (1869) 369, 384.

Vertex feebly concave between antennal supports; frons rectangular, broader than deep; eyes divided into two lobes connected by a fine line, inferior lobe subrectangular, wider than deep, antennae one and one-fourth to one and two-thirds as long

as body in male, generally shorter than body in female, last segment hooked distally in male, prothorax transverse, tuberculate anteriorly at each side, bearing three swellings on center of notal disc; elytra slightly raised at middle of base of each, rounded posteriorly; middle intercoxal process distinctly tuberculate and vertical anteriorly.

Genotype.—*Coptops parallela* Serville (*ædificator* Fabr.)

Range.—Ethiopian and Oriental Regions.

Key to the Hainan species of Coptops.

- Dorsal surface closely mottled with tawny, gray-brown, and black; antennæ over one and one-half times as long as body in male; body more than 18 millimeters long..... *leucostictica rustica*.
 Dorsal surface irregularly banded with brown, grayish white and pinkish; antennæ one and one-fourth as long as body in male; body less than 16 millimeters long..... *lichenea*.

COPTOPS LEUCOSTICTICA RUSTICA Gressitt subsp. nov. Plate 3, fig. 3.

Coptops polyspila GAHAN (*nec* Pascoe), Ann. & Mag. Nat. Hist. (7)
 5 (1900) 351, Hainan.

Male.—Large; slightly narrowed posteriorly. Body black, largely clothed with mottled gray, tawny, and brown pubescence; head irregularly speckled with tawny and whitish pubescence; antennæ with scape similarly speckled or banded, third and following segments tawny-gray basally; prothorax largely clothed with gray-brown, mottled with tawny and whitish, and dotted with black; scutellum tawny; elytra mottled rusty brown, tawny, and grayish-white, with an indistinct, transverse, darker band before, and another behind, middle; ventral surfaces entirely clothed with mottled tawny and gray-brown pubescence; legs tawny, spotted with light brown; apices of tibiæ black; tarsi black with a little grayish white on inner side of first, base of second, apices of lobes of third, and middle of fifth, segment. Antennæ fringed internally with black hairs to apices.

Head rounded-concave between antennal supports, sparsely punctured, entire surface minutely punctulate; frons a little broader than deep; inferior eye lobes slightly wider than deep. Antennæ nearly one and two-thirds times as long as body; scape irregularly punctured, slightly longer than third segment; last segment distinctly hooked apically. Prothorax transverse, swollen laterally, two blunt swellings on upper portion of each side, before and behind middle, five swellings on notal disc, a median sulcus dividing anterior two swellings and bisecting middle posterior swelling; surfaces with scattered subasperate punctures.

Elytra subrounded apically, slightly swollen at extreme bases; surfaces deeply subasperate-punctate basally, distinctly punctured as far as apices. Mesosternal process bluntly tuberculate anteriorly.

Holotype, length, 21.5 millimeters; breadth, 9.7.

Paratypes, length, 16.5 to 24 millimeters; breadth, 7 to 10.2.

Female.—Antennæ seven-eighths as long as body, last segment not hooked; elytra subparallel.

Allotopotype, length, 21.5 millimeters; breadth, 9.6.

Paratypes, length, 17 to 23 millimeters; breadth, 7 to 10.

Holotype, male, No. 53458 United States National Museum, Tai-pin-ts'uen (Dwa-Bi), near Loi Mother Mountain, central Hainan, altitude 380 meters, July 21, 1935, taken by the author; allotopotype, female, in the author's collection, July 24, numerous paratopotypes, in the Lingnan Natural History Museum, the author's collection, the California Academy of Sciences, the British Museum, and Musée Heude, July 21 to 26, 1935, taken by the author; one paratopotype, July 23, 1935, one F. K. To; three paratypes, between Fan-ta and Chung-kon-ts'uen, altitude 300 meters, July 17, 1935, taken by the author; numerous paratypes, Nam-liu-tin, August 1 and 2, Sam-kwong-ts'uen, Lam-wan-tung, Kiung-shan District, August 10 to 20, Nam-po, August 22 and 23, 1935, F. K. To; one paratype, Ta-hau, 30 kilometers west-southwest of Nodoa, July 24, 1935, taken by the author.

Differs from *C. leucostictica* White in being spotted with tawny instead of white, in having the bases of the antennal segments grayish white instead of fawn-colored and the elytral bases more coarsely asperate-punctate. Differs from *Coptops leucostictica polyspila* (Pascoe) comb. nov. in having the dorsal spots smaller and tawny instead of brick-red, the elytral bases more coarsely punctured, and in other respects.

Distribution.—Hainan Island.

COPTOPS LICHENEA Pascoe. Plate 3, fig. 4.

Coptops lichenea PASCOE, Trans. Ent. Soc. London (3) 3 (1865) 118, Malacca.

Male.—Short, subparallel and rounded posteriorly; dorsoventrally somewhat compressed. Body mainly dark reddish brown above, brownish beneath, largely clothed with brown, gray, or reddish pubescence: head with mottled dark-brown and tawny-brick-red pubescence; antennæ pale brick-red on first two segments and bases of third and following segments, changing to pale gray on bases of apical segments; prothorax largely pale

gray, dotted with brown at sides; dark brown on discal swellings and brick-red between latter; elytra grayish brown, with an irregular basal band, a wider median band, a narrow, zig-zag, gray band behind middle, a humeral spot and several narrow red spots or stripes on apical half; ventral surfaces tawny, mixed with brick-red and finely spotted or blotched with dark brown at sides; legs brick-red banded with dark brown; tarsi grayish, dark brown on most of third segment, and on base and apex of last segment.

Head sparsely punctured. Antennæ one and one-fifth as long as body; scape a little longer than third segment. Prothoracic disc with three rounded swellings forming a triangle, posterior swelling grooved medially. Elytra with bases swollen on each side of suture; surfaces rather closely and deeply punctured on basal half, subasperately so near base.

Length, 14 millimeters; breadth, 5.6.

Female.—Antennæ seven-eighths as long as body.

Length, 11 to 15.3 millimeters; breadth, 4.6 to 6.8.

Four specimens were collected by the author at Dwa-Bi (Tai-pin-ts'uen), July 22 to 25, Loi Mother Mountain, July 26, and Fan-ta (east of Nam-fung), July 17, 1935; 2 were taken by F. K. To at Nam-po-ts'uen (Loi territory), Ch'eng-mai District, August 28 to 31, 1935.

New to Hainan.

Distribution.—Malacca; Hainan Island.

Genus CHÆROMORPHA Chevrolat

Chæromorpha CHEVROLAT, Dict. Hist. Nat. d'Orbigny 3 (1849) 613;

GAHAN, Journ. Fed. Malay States Mus. 1 (1906) 117, note.

Agelasta THOMSON, Syst. Cer. (1864) 371; PASCOE, Trans. Ent. Soc.

London (3) 3 (1865) 96, 123, part; LACORDAIRE, Gen. Col. 9 (1869) 369, 376.

Vertex level between antennal insertions; frons subtrapeziform, broader than deep, wider above than below; eyes divided into two not very distant lobes joined by a fine line, inferior lobe about as deep as wide; antennæ slightly longer than body in male and slightly shorter than body in female; prothorax transverse, feebly swollen laterally, evenly convex above; middle intercoxal process broad, evenly convex anteriorly, horizontal beneath, vertical anteriorly from side view; pronotum, scutellum, and elytral bases on same level.

Genotype.—*Chæromorpha pigra* Aurivillius.

Range.—Oriental Region; Indo-Australian Subregion.

The name of this genus and its type *pigra* were proposed, without descriptions, by Dejean in his Catalogue. Chevrolat, in d'Orbigny's Dictionnaire, first characterized the genus, but did not describe any species. Gahan was the first to describe a species as a *Chæromorpha*.¹⁴ Notwithstanding the fact that the species *pigra* was not described until 1920, by Aurivillius (2, p. 16), I am considering it the type of the genus since it was the only species mentioned in both the original publication and the first characterization of the genus, though both times as a *nomen nudum*.

CHÆROMORPHA FORMOSANA ¹⁵ **PALMINSULANA** Gressitt subsp. nov. Plate 4, fig. 2.

Female.—Broad, abbreviated, suboval, evenly convex dorsally. Body brownish black, slightly reddish along posterior portions of suture; surfaces in part clothed with whitish-gray pubescence, leaving blackish markings of subglabrous areas; head largely pubescent, with middle of frons thinly clothed and occiput with a pair of longitudinal blackish stripes; antennæ clothed with gray pubescence: scape spotted with black, apical halves of third and following segments entirely black; prothorax clothed with dull-gray pubescence, irregularly marked with small spots and dots of thin, black pubescence; scutellum partly clothed with gray; elytra clothed with whitish gray, marked with subglabrous black areas clothed with thin blackish pubescence as follows: a small area on base of each bordering scutellum, a broad, transverse band near base and reaching to just behind end of basal third, a number of irregular angular spots on remainder, a few small spots arranged in a transverse band just before middle, another band, of slightly larger spots, just behind middle; ventral surfaces of body clothed with grayish-white pubescence, marked with a few small, brownish spots along sides of thorax and abdomen, middle portions of abdominal sternites subglabrous, legs grayish with tarsi, apical portions of tibiæ, and a few spots on femora, black. Antennæ fringed with black internally.

Head feebly convex, sparsely punctured in front; inferior eye-lobes a little deeper than wide, subtriangular. Antennæ as long as body; scape about as long as third segment; fourth segment three-fourths as long as third. Prothorax nearly twice as broad as long, moderately convex laterally, disc evenly convex, sparsely

¹⁴ *C. robinsoni*, Journ. Fed. Malay States Mus. 1 (1906) 117.

¹⁵ *Agelasta formosana* SCHWARZER, Ent. Blätter 21 (1925) 61, Formosa.

and shallowly punctured. Elytra short, narrowed and subrounded apically, rather closely punctured, punctures deep on basal half.

Length, 11.2 millimeters; breadth, 4.8.

Holotype, female, loan deposit, California Academy of Sciences, Chung-kon-ts'uen, east of Nodda, Hainan, July 18, 1935, taken by the author; allotype, male, in the Lingnan Natural History Museum, Tai-tsing-lam-ts'uen, near Loi Mother Mountain, June 7, 1935, F. K. To; paratype, male, in the United States National Museum, Tai-tsing-lam-ts'uen, June 7 to 10, 1935, F. K. To.

Differs from the typical form in being broader, in having the elytra much more densely punctured, the elytral spots less numerous with the subbasal band broader and more complete, and the tarsi entirely black. The name *palminsulana* refers to Hainan: "The Isle of Palms", as designated by American missionaries.

Distribution.—Hainan Island.

Genus *FALSOMESOSELLA* Pic

Falsomesosella Pic, Mel. Exot. Ent. 44 (1925) 27.

Head rounded-concave between antennal insertions, strongly swollen on frons; eyes rather coarsely faceted, deeply emarginate, inferior lobe small, higher than wide; antennæ but slightly exceeding body in length, fringed beneath; scape reaching to middle of prothorax, widened externally at apex, bearing an internally open cicatrix; fifth and following segments each much shorter than third or fourth; prothorax broader than long, rounded at sides, evenly convex above; elytra about twice as long as broad, more or less rounded and obsoletely truncated at apices; disc of each weakly swollen near scutellum; anterior coxæ large; intercoxal process of mesosternum small, depressed; first abdominal segment more or less fringed apically, following segment with a partially hidden concavity, at least in male.

Genotype.—*Falsomesosella albofasciata* Pic.

Range.—South China; Hainan; Formosa; Japan.

FALSOMESOSELLA HAKKA Gressitt.

Falsomesosella hakka GRESSITT, Lingnan Sci. Journ. 16 (1937) 597, Kwangtung; *ibid.* 18 (1939) 64, pl. 2, fig. 5.

Female.—Dark brown to reddish brown or black, largely clothed with pubescence; head tawny, mottled with dark brown;

antennæ rusty, third and fourth segments with pale-tawny hairs except for dark apices and some small, scattered, brown spots; prothorax dark brown, mottled with tawny; scutellum subglabrous, dark brown; elytra with two black-spotted, transverse, whitish bands of similar width, the first close to base, the second just behind middle, remaining surfaces rusty brown dotted with black, the latter predominating behind both transverse bands, suture slightly whitish before apices; ventral surfaces and legs grayish tawny, blotched with blackish brown.

Head feebly concave between antennal insertions, finely punctured; frons a little broader than deep. Antennæ barely longer than body; scape nearly as long as third segment, subequal to fourth segment. Prothorax a little broader than long, rounded laterally, closely and finely punctured on disc. Elytra broadest behind middle; apices rounded-truncate; surfaces deeply subseriate-punctate.

Length, 6.5 millimeters; breadth, 2.5.

A single female, in the Lingnan Natural History Museum, was taken at Tai-tsing-lam-ts'uen, near Lai-mo-ling, June 11, 1935, by F. K. To.

New to Hainan.

Distribution.—Kwangtung Province; Hainan Island.

ANCYLONOTINI

ANCYLONOTIDES Lacordaire, Gen. Col. 9 (1869) 299, 391.

ANCYLONOTINI Aurivillius, Col. Cat. 73 (1922) 152.

Frons subrectangular; vertex concave between antennal insertions; eyes finely faceted; antennal scape with an open, granular cicatrix; elytra more or less tuberculate basally; anterior coxal cavities angulate externally, open posteriorly; middle coxal cavities open to epimera externally, separated by a broad, gradually declivitous lamelliform process; middle tibiæ notched externally; tarsal claws divaricate.

Genus PALIMNA Pascoe

Palimna PASCOE, Journ. Ent. 1 (1862) 346; Trans. Ent. Soc. London (3) 3 (1865) 96, 134; THOMSON, Syst. Cer. (1864) 369; LACORDAIRE, Gen. Col. 9 (1869) 392.

Cylanca THOMSON, Syst. Cer. (1864) 58, 132, 484.

Frons more or less granulose; inferior eye lobes a little deeper than wide; antennæ at least twice as long as body in male, seventh segment hooked, or at least swollen, endoapically; pro-

thorax briefly tuberculate laterally, with low swellings and granules on disc; elytra with humeral granules, subbasal tubercles, an oblique median ridge, and subrounded apices.

Genotype.—*Golsinda tessellata* Pascoe.

Range.—Oriental Region.

According to some of the characters used by Bates in erecting his genus *Apalimna* for one Japanese and one North Indian species, one of the following forms should fall in *Apalimna*, and is described as a subspecies of a form placed in the genus by Schwarzer. However, I feel that the type of *Apalimna* hardly merits more than subgeneric separation, and that the two Formosan species, *palimnoides* Schwarzer and *formosana* Kano, are closer to *Palimna* than to *Apalimna*, differing only from the species placed in the former by lacking a distinct internal projection at the apex of the seventh antennal segment of the male, and agreeing with them in the degree of tuberculation of the sides of the prothorax, the humeri, and the basal portions of the elytral discs.

Key to the Hainan species of Palimna.

Seventh antennal segment of male with a prominent internal projection at apex; scutellum nontuberculate; elytra with two pairs of contiguous, laterally compressed tubercles near base; last abdominal sternite of female one-half as long as preceding sternites together.

annulata tessellata.

Seventh antennal segment of male lacking a prominent internal projection at apex; scutellum nontuberculate; elytra with two pairs of contiguous, laterally compressed tubercles near base; last abdominal sternite of female nearly as long as preceding sternites combined.

palimnoides similis.

PALIMNA ANNULATA TESSELLATA (Pascoe). Plate 3, fig. 11.

Golsinda tessellata PASCOE, Trans. Ent. Soc. London (2) 4 (1857) 49, Borneo.

Palimna tessellata PASCOE, Trans. Ent. Soc. London (3) 3 (1865) 135, pl. 6, fig. 2.

Palimna annulata var. *tessellata* AURIVILLIUS, Col. Cat. 73 (1922) 152.

Male.—Black to brownish black, largely clothed with white or grayish pubescence: head clothed with white except across upper part of frons and front of vertex, which are black; antennæ with middle of scape and bases of following segments grayish white; prothorax white with black granules and a pair of interrupted, suboblique, gray-brown stripes from anterior border to near base; scutellum white with black sides; elytra in large part covered with oval, white areas, light gray-brown or whitish gray on intervening spaces; ventral surfaces silvery white on meta-

sternum, grayish white on abdomen; legs whitish, banded with black.

Head sparsely granulose on lower and upper ends of frons, shallowly concave between antennal insertions; antennæ twice as long as body; scape two-thirds as long as third segment; seventh segment armed endoapically; prothorax feebly tuberculate laterally; disc swollen on each side, with numerous granules; scutellum bituberculate; elytra coarsely nodose at humeri; disc of each with two erect tubercles near base, one before other, and coarse punctures, particularly on basal portions of sides.

Length, 24 to 27 millimeters; breadth, 9 to 10.8.

Female.—Antennæ one and two-fifths as long as body, lacking a projection on seventh segment.

Length, 22 millimeters; breadth, 8.

Five specimens were taken at Sam-kwong-ts'uen, Lam-wan-tung, Kiung-shan District, Hainan, August 5 to 14, Nam-po, August 22 and 23, 1935, and Nodoa, April 1932, by F. K. To.

Distribution.—Borneo; Java; Malacca; Siam; Hainan.

PALIMNA PALIMNOIDES ¹⁶ *SIMILIS* Gressitt subsp. nov.

Female.—Body black, extensively marked with areas of white pubescence; head clothed with white except on upper portion of frons, front of vertex, most of occiput, and sides behind eyes; antennæ black with middle of scape and bases of following segments white; prothorax clothed with white on sides, along base, and along a median stripe, the latter crossed by a transverse white bar at center, remainder black with brownish-black pubescence; scutellum white along middle and on apical portion; elytra white on dorsal surface of basal two-fifths, except around sub-basal tubercles and scutellum, remainder with a number of oval white spots of various sizes, in part confluent; ventral surfaces densely clothed with silvery white on thoracic sterna, more sparsely so on abdomen; legs largely white; femora banded with black near middle and apex, tibiae black at base, middle and apex, and tarsi black on third to fifth segments, and on borders of first two segments.

Head directed posteriorly beneath; frons wider below than above, with numerous granules over entire surface; vertex sub-obtusely concave between antennal supports; the latter and occiput almost lacking granules. Antennæ one and one-half times as long as body; scape three-fourths as long as third segment; second to sixth segments distinctly swollen apically. Prothorax

¹⁶ *Apalimna palimnoides* Schwarzer, Ent. Blätter 21 (1925) 62, Formosa.

briefly tuberculate laterally, swollen across central portion, disc with scattered, shiny granules and a slight median groove before center. Scutellum triangular, slightly depressed along median line. Elytra narrowed and rounded posteriorly; humeri swollen and subnodose; disc of each with two laterally compressed, subadjacent tubercles near base, and several small tubercles near scutellum, coarsely rugose-punctate at sides of basal half and on middle of disc, more finely so on remainder. Last abdominal sternite nearly as long as preceding four abdominal sternites combined.

Length, 18 millimeters; breadth, 7.

Holotype, male, loan deposit, California Academy of Sciences, Tai-pin-ts'uen (Dwa-Bi), near Loi Mother Mountain, central Hainan, July 23, 1935, taken by the author.

Differs from *Palimna palimnoides* (Schwarzer) comb. nov. in having the lateral tubercles of the prothorax shorter and blunter, the pronotal disc more suddenly constricted before and behind, its center less depressed, the humeral swellings less nodose, the elytral bases near the scutellum more tuberculate, and in other respects. Very similar in markings to the preceding species, but having the frons more granulose, the pronotum less granulose, the vertex more concave, and the elytral bases less sharply tuberculate.

Distribution.—Hainan Island.

XYLORHIZINI

XYLORHIZIDES Lacordaire, Gen. Col. 9 (1872) 413, 443.

XYLORHIZINI Aurivillius, Col. Cat. 73 (1922) 208.

Frons subrectangular; vertex concave; antennæ rarely longer than body; scape lacking a cicatrix; prothorax with or without lateral tubercles; elytra considerably broader than prothorax; anterior coxal cavities angulate externally; anterior coxæ prominent; middle coxal cavities open externally to epimera; intercoxal processes unarmed; middle tibiæ obliquely grooved externally; tarsal claws divergent.

Genus XYLORHIZA Castelnau

Xylorhiza CASTELNAU, Hist. Nat. Col. 2 (1840) 476; THOMSON, Classif. Cer. (1860) 38; Syst. Cer. (1864) 366; PASCOE, Trans. Ent. Soc. London (3) 3 (1865) 162; LACORDAIRE, Gen. Col. 9 (1872) 444, 445.

Vertex deeply concave between antennal supports; frons grooved medially; eyes small, deeply emarginate; antennæ shorter

than body, densely fringed on undersides of basal segments; prothorax nontuberculate, subcylindrical; elytra long, separately emarginate, lobed apically; posterior femora only reaching slightly beyond second abdominal segment.

Genotype.—*Xylorhiza venosa* Castelnau (*adusta* Wied.)

Range.—Southeastern continental Asia; Hainan; Hongkong; Formosa; Sumbawa.

XYLORHIZA ADUSTA (Wiedemann).

Lamia adusta WIEDEMANN, Zool. Mag. (1) 3 (1819) 182, Bengalìa, *Xylorhiza venosa* CASTELNAU, Hist. Nat. Col. 2 (1840) 476; PASCOE, Trans. Ent. Soc. London (3) 3 (1865) 162; LACORDAIRE, Gen. Col. 9 (1872) 446; LATREILLE in Cuvier, Regne Anim. 4 (1817) pl. 14, fig. 7; *ibid.* ed. 2 3 (1830) pl. 18, fig. 7; COTES, Ind. Mus. Notes 3 (1894) 47, *biol.*

Xylorhiza adusta GAHAN, Ann. Mus. Civ. Genova 34 (1894) 58; GRESSITT, Lingnan Sci. Journ. 18 (1939) 66.

Female.—Black to brownish black on dorsal surfaces and dark brown beneath, clothed with thick pubescence, finely striped with darker and lighter brown: head pale buff along middle, darker on genæ and sides of frons; antennæ with buff and brown on first three segments, following segments thinly clothed with grayish brown; prothorax dark brown, rusty at base, with two narrow, median, pale-buff stripes converging at basal margin, and two narrower, oblique, pale-buff stripes above middle of sides; scutellum reddish golden, with a fine, median, buff stripe; elytra narrowly striped longitudinally with various shades of buff, and with dark-brown on base, along median lines, near suture and external margin, and apices; ventral surfaces and legs dark brown streaked with buff.

Head with median glabrous line; vertex broadly concave; inferior eye lobes small and deeper than wide. Antennæ five-sixths as long as body. Prothorax nearly as long as broad, feebly swollen at sides; disc irregular, with some coarse punctures. Elytra long, obliquely truncate apically, with sutural angles bluntly produced; bases sparsely punctured.

Length, 40 millimeters; breadth, 11.8.

Description based on a specimen from Hongkong.

A single specimen, in the Musée Heude, was collected in Hainan by Commander G. Ros in the spring of 1936.

New to Hainan.

Distribution.—Bengal; Burma; Peninsula of southeastern Asia; Hainan; Hongkong; Formosa.

DORCASCHEMATINI

DORCASCHEMITÆ Thomson, Classif. Cer. (1860) 104, 107; Syst. Cer. (1864) 90, 340.

DORCASCHEMIDES Lacordaire, Gen. Col. 9 (1872) 415, 456.

DORCASCHEMATINI Aurivillius, Col. Cat. 73 (1922) 213.

Frons rectangular; vertex concave, narrow; antennal tubercles deeply emarginate anteriorly; antennæ slender, much longer than body; scape short, swollen and granulose above; prothorax subcylindrical, nontuberculate; elytra narrow, rounded or subangulate apically; anterior coxæ subglobular, their cavities angulate externally; middle coxal cavities open externally; middle tibiæ obliquely grooved preapically; tarsal claws divaricate.

Genus OLENOCAMPTUS Chevrolat

Olenocamptus CHEVROLAT, Mag. Zool. 5 (1835) 134; THOMSON, Syst. Cer. (1864) 386; LACORDAIRE, Gen. Col. 9 (1872) 457, 458.

Authades THOMSON, Archives Ent. 1 (1857) 191; Syst. Cer. (1864) 386.

Ibidimorphum MOTSCHULSKY, Schrenck's Reisen Amurland Col. (1860) 153.

Head broader than prothorax; frons wider than high; eyes large, deeply emarginate, inferior lobes wider than deep; antennæ more than twice as long as body in both sexes; scape file-like above; prothorax longer than broad, transversely folded on central portion; elytra subangulate apically; legs slender, anterior pair longer than others; posterior femora reaching to fourth abdominal segment; tarsi short.

Genotype.—*Olenocamptus serratus* Chevrolat. (*bilobus* Fabr.).

Range.—Oriental Region; Indo-Australian Subregion.

OLENOCAMPTUS BILOBUS (Fabricius).

Saperda biloba FABRICIUS, Syst. Eleuth. 2 (1801) 324.

Olenocamptus bilobus PASCOE, Trans. Ent. Soc. London (3) 3 (1866) 316; GAHAN, Ann. & Mag. Nat. Hist. (5) 7 (1900) 351, Hainan; MAXWELL-LEFROY, Ind. Ins. Life (1909) 376.

Male.—Slender, subparallel. Body brownish black, light reddish brown on antennæ, palpi, elytra, and legs; clothed with thin, fawn-colored, and dense, silvery white, pubescence: head pale tawny on vertex, occiput, and upper parts of sides, remainder white; antennæ nearly glabrous; prothorax grayish buff above, brown along middle of each side, and white beneath; scutellum white; elytra fawn-colored with a subbasal oval spot adjacent to suture, a smaller oval spot before middle and nearer margin than suture, and a larger, subrounded spot, nearer suture than

margin, behind middle, of thick, white pubescence; ventral surfaces clothed with silvery white on sides, grayish white on median portions of sternites; legs thinly clothed with white on femora, golden on tibiae.

Head fully as wide as deep, finely carinate on frons and vertex, nearly impunctate; eyes prominent; antennae two and two-thirds times as long as body; minutely thorny beneath; scape about one-fourth as long as third segment; prothorax one and one-third as long as broad, a little narrower at base than at apex, constricted near each end: elytra rather closely punctured.

Length, 13 millimeters; breadth, 3.

Female.—Antennae two and one-fourth times as long as body, unarmed beneath; last abdominal sternite as long as two preceding abdominal sternites.

Length, 15 millimeters; breadth, 3.6.

One male and 1 female, in the author's collection, were taken by the author at Ta-hian, near Five Finger Mountains, June 12, and Liamui (Leng-moon), August 1, 1935, respectively; the Lingnan Natural History Museum possesses specimens from Tai-pin-ts'uen, May, 1935, F. K. To, and Sam-ah-kong, southern Hainan, May, 1932, W. E. Hoffmann and O. K. Lau. I have seen one of the specimens collected by Whitehead in 1899.

Distribution.—Seychelles; Ceylon; India; Burma; Siam; Indo-China; Malacca; Malay Archipelago; Hainan; Hongkong; Formosa; Ryu Kiu Islands; South China.

XENOLEINI

XENOLEIDES Lacordaire, Gen. Col. 9 (1872) 460.

XENOLEINI Aurivillius, Col. Cat. 73 (1922) 216.

Head not retractile; frons subtrapeziform; eyes coarsely faceted; antennae slender; scape short, swollen, granulose apically; prothorax tuberculate laterally; elytra even, rounded apically; middle coxal cavities nearly closed to epimera externally; intercoxal process simple, gradually declivitous; middle tibiae grooved externally; tarsal claws divaricate.

Genus XENOLEA Thomson

Xenolea THOMSON, Syst. Cer. (1864) 91; LACORDAIRE, Gen. Col. 9 (1872) 460.

Æoschopalæa PASCOE, Trans. Ent. Soc. London (3) 3 (1864) 24.

Head narrower than prothorax, deeper than broad; frons higher than wide above; inferior eye lobes deeper than wide; vertex narrowly concave between antennal insertions; antennae

more than twice as long as body in male, nearly twice as long in female; prothorax subcylindrical, tuberculate; elytra separately rounded apically.

Genotype.—*Xenolea collaris* Thomson.

Range.—Malay Archipelago; Hainan; South China; Japan; Formosa.

XENOLEA TOMENTOSA ASIATICA (Pic). Plate 4, fig. 14.

Æschopalea asiatica PIC, Echange (40) 41 (1925) 16, Tonkin.

Xenolea asiatica GRESSITT, Lingnan Sci. Journ. 17 (1938) 158, Szechwan.

Xenolea tomentosa asiatica GRESSITT, Lingnan Sci. Journ. 18 (1939) 69, Kwangtung.

Male.—Brownish black, mixed in part with reddish brown on elytra and pronotum; antennæ reddish, scape and apices of following segments blackish; body irregularly mottled with tawny pubescence on dorsal surfaces, denser on sides and apices of elytra, evenly and entirely clothed with paler, more green-gold, pubescence on ventral surfaces; antennæ with very thin, golden-tawny pubescence, and a few short, erect hairs on undersides of basal segments; legs thinly clothed with green-gold.

Head finely punctured; inferior eye lobes a little deeper than wide. Antennæ two and one-third times as long as body. Scape three-fifths as long as third segment; third and following segments subequal. Prothorax about as broad as long, with a large stout tubercle at each side; disc rather closely punctured, except along median line, slightly swollen a short distance behind center. Elytra slightly narrowed posteriorly, separately subrounded apically; surfaces feebly swollen near base, closely punctured throughout; legs with femora swollen and tarsi small; first segment of latter as long as following two segments combined.

Length, 8.5 to 9.2 millimeters; breadth, 2.7 to 3.

Two males were collected on Hainan: 1 by the Lingnan Univ. Fifth Hainan Exped., Nodda, at lights, August 15, 1929, 1 by the author at Ta-hau, near Vo-lau, 30 kilometers westsouthwest of Nodda, July 8, 1935.

New to Hainan.

Distribution.—Indo-China; southern and western China; Hainan; Formosa.

NYCTIMENINI

NYCTIMENITES Thomson, Syst. Cer. (1864) 94, 341.

NYCTIMENIDES Lacordaire, Gen. Col. 9 (182) 415, 467.

NYCTIMENINI Aurivillius, Col. Cat. 73 (1922) 218.

Head distant from anterior coxæ; frons subrectangular; antennæ slender; scape subcylindrical, lacking a cicatrix; prothorax cylindrical, nontuberculate; middle coxal cavities open to epimera externally; intercoxal process low, feebly declivitous, unarmed; middle tibiæ grooved preapically on outer sides; tarsal claws divaricate.

Genus EUSEBOIDES Gahan

Euseboides GAHAN, Ann. & Mag. Nat. Hist. (6) 11 (1893) 385.

Slender, narrowed posteriorly; head fully as broad as apex of prothorax, concave between antennal insertions; inferior eye lobes vertical; antennæ a little longer than body; prothorax cylindrical, longer than broad; elytra long and narrow, acuminate ectoapically; metepisternum very narrow, parallel-sided; first four abdominal segments gradually decreasing in length.

Genotype.—*Euseboides plagiatus* Gahan.

Range.—India; Hainan; Formosa; Ryu Kyu Islands.

EUSEBOIDES MATSUDAI SPINIPENNIS Gressitt subsp. nov. Plate 4, fig. 8.

Male.—Very slender, slightly narrowed posteriorly. Body blackish brown, somewhat reddish along sides and suture of elytra and on antennæ (except for scape and apices of following segments) and legs; thinly clothed with tawny pubescence; head entirely clothed in front, sparsely so on occiput, with four longitudinal stripes posteriorly; antennæ sparsely clothed with tawny-gray on basal portions of segments, and with dark brown at apices; prothorax with longitudinal stripes of tawny along sides and lateral margins of notal disc, a faint streak along median line; scutellum tawny; elytra sparsely and irregularly clothed with tawny and grayish, a short stripe of denser pubescence extending back a short distance from inner side of humerus, a small spot near suture about two-fifths elytral length before apex, and apical fifth obliquely banded with dense tawny; ventral surfaces irregularly clothed with tawny, last three abdominal segments densely clothed and with glabrous dots of varying size.

Head closely punctured; frons square, convex; vertex moderately concave; inferior eye lobes twice as deep as wide. Antennæ one and one-third as long as body, slender; scape subcylindrical in apical half; third segment a little shorter than fourth; fourth segment nearly as long as scape. Prothorax nearly cylindrical, a little broader at apex than at base, rather densely punctured. Scutellum broadly shield-shaped. Elytra slender, slightly narrowed; apices obliquely emarginate-trun-

cate, acutely produced exteriorly. Ventral surfaces distinctly punctured except on last three abdominal segments.

Holotype, loan deposit, California Academy of Sciences, Taipei-ts'uen (Dwa-Bi), near Loi Mother Mountain, central Hainan, July 23, 1935, taken by the author.

Differs from *E. matsudai*¹⁷ Gressitt in having the prothorax more cylindrical, the elytral apices more acute, the dorsal punctation coarser, the last three abdominal segments nearly impunctate, and the abdomen not distinctly striped with pubescence.

Distribution.—Hainan Island.

HECYRINI

HECYRIDIDES Lacordaire, Gen. Col. 9 (1872) 416, 517.

HECYRINI Aurivillius, Col. Cat. 73 (1922) 243.

Head retractile; frons rectangular; vertex concave; eyes subcoarsely faceted; antennal scape swollen, lacking a cicatrix; prothorax bituberculate laterally; elytra long, parallel; pro- and mesosternal intercoxal processes vertical anteriorly; middle coxal cavities open externally; middle tibiae ungrooved; tarsal claws divaricate.

Genus MÆCHOTYPA Thomson

Mæchotypa THOMSON, Syst. Cer. (1864) 55, 368; PASCOE, Trans. Ent. Soc. London (3) 3 (1864) 85.

Scotinauges PASCOE, Ann. & Mag. Nat. Hist. (4) 8 (1871) 277.

Tylophorus BLESSIG, Horae Soc. Ent. Ross. 9 (1873) 213.

Stout-bodied, suboblong, rounded posteriorly; vertex broadly concave, sulcate medially; eyes divided, with superior and inferior lobes connected by a fine line; antennæ a little longer than body in male, about as long as body in female; scape short, thickened apically; prothorax transverse, swollen on disc; elytra rounded apically.

Genotype.—*Mæchotypa arida* Thomson (*suffusa* Pascoe).

Range.—Northern India; southeastern Asia; North China; Korea; Hainan; Borneo; Formosa.

MÆCHOTYPA SUFFUSA (Pascoe).

Niphona suffusa PASCOE, Journ. Ent. 1 (1862) 336, Cambodia.

Mæchotypa arida THOMSON, Syst. Cer. (1864) 55, Laos; LACORDAIRE, Gen. Col. 9 (1869) 519, pl. 102, fig. 2.

Mæchotypa suffusa AURIVILLIUS, Col. Cat. 73 (1922) 245.

¹⁷ Philip. Journ. Sci. 65 (1938) 163, pl. 1, fig. 2, Formosa.

Male.—Brownish black, almost entirely clothed with thick pinkish red, dark brown, and gray pubescence: head pinkish red, grayish on vertex, a transverse brown band across middle of frons, an obtuse band on occiput; antennæ dark brown, bases of third to sixth segments pinkish, bases of following segments gray; prothorax pinkish, mixed with white hairs, swellings on pronotal disc and some median spots and lateral dots, dark brown; scutellum dark brown, edged laterally with pink and then whitish; elytra pinkish at base and apex and along margins and suture, and four or five slender, obliquely longitudinal stripes, a dark-brown band just behind base, and two narrow, incomplete, zig-zag bands, the first at about middle, the second at beginning of apical quarter; ventral surfaces pinkish, a dark-brown spot at middle and each side of base of each abdominal segment.

Head deeply punctured; inferior eye lobes subrectangular, wider than deep. Antennæ nearly one and one-half times as long as body; scape one-half as long as third segment. Prothorax broad, strongly swollen and sparsely punctured on each side of disc; a blunt tubercle before, another tubercle behind middle of each side; disc grooved behind center. Elytra shallowly punctured; middle of base of each with an erect tubercle followed by a small swelling.

Length, 22.5 millimeters; breadth, 9.

Female.—Antennæ barely longer than body; last abdominal sternite as long as two preceding, medially grooved at base and apex.

Length, 23 millimeters; breadth, 8.5.

One male, in the Lingnan Natural History Museum, Chungmei, Hainan, August 28, 1932, 1 female, Nam-ting-ts'uen, February 8, 1935, F. K. To; 1 female, in the author's collection, collected in a groove near Beggar Village, southwest of Nodoa, July 9, 1929, by the Lingnan Univ. Fifth Hainan Exped.

New to Hainan.

Distribution.—Indo-China (Cambodia and Laos); Hainan.

NIPHONINI

NIPHONINÆ Pascoe, Trans. Ent. Soc. London (3) 3 (1864) 7, 56.

NIPHONIDES Lacordaire, Gen. Col. 9 (1872) 414, 519.

NIPHONINI Aurivillius, Col. Cat. 73 (1922) 245.

Head more or less retractile; frons rectangular, or broader above than below; vertex feebly concave; eyes emarginate or

divided; antennæ rarely longer than body; scape lacking a cica-trix; middle coxal cavities open to epimera externally; middle tibiæ ungrooved exteriorly; tarsal claws divergent.

Key to the Hainan genera of Niphonini.

1. Eyes completely divided, lobes connected by a fine thread..... 2.
Eyes deeply emarginate, not divided..... 4.
2. Elytra declivitous posteriorly; antennal scape subcylindrical, as long as, or nearly as long as, third segment; prothorax subcylindrical or evenly swollen 3.
Elytra hardly declivitous posteriorly; antennal scape swollen, generally shorter than third segment; prothorax swollen, subtuberculate and generally rugose or sulcate on disc; elytra more or less tuberculate basally, their apices truncate or emarginate..... *Niphona*.
3. Eyes coarsely or subcoarsely faceted; elytra separately rounded or obtuse apically; third antennal segment no longer than scape.

Pterolophia.

Eyes finely faceted; elytra separately acute apically; third antennal segment longer than scape *Lychrosia*.

4. Body lacking long, erect hairs; antennæ briefly setose beneath; prothorax broader than long; eyes coarsely faceted..... 5.
Body and antennæ clothed with long, erect hairs; prothorax at least as long as broad; eyes finely faceted..... *Enispia*.
5. Prothorax nontuberculate, broadest near anterior end..... *Desisa*.
Prothorax with a small, acute tubercle just behind middle of each side, slightly narrowed at apex and base..... *Phesates*.

Genus NIPHONA Mulsant

Niphona MULSANT, Col. France Long. ed. 1 (1839) 169; THOMSON, Syst. Cer. (1864) 368; LACORDAIRE, Gen. Col. 9 (1872) 522, 530; GANGLBAUER, Bestimm.-Tab. eur. Col. 7 (1882) 694.

Ocheutes THOMSON, Syst. Cer. (1864) 54.

Ælara THOMSON, *ibid.* 55, 368.

Frons broader above than below; vertex feebly concave; eyes divided and coarsely faceted, inferior lobes generally transverse; antennæ about as long as, or a little longer than, body; scape thick and short; prothorax short, swollen, generally grooved or rugose; elytra often tuberculate basally, with apices truncate or emarginate; mesosternal process tuberculate.

Genotype.—*Niphona picticornis* Mulsant.

Range.—Southern Palearctic, Ethiopian, and Oriental Regions.

Key to the Hainan species of Niphona.

1. Elytral apices obliquely truncate, feebly emarginate; dorsal surfaces largely clothed with dense, tawny pubescence..... 2.
Elytral apices emarginate-truncate with all angles produced; dorsal surfaces unevenly clothed with gray, or rusty brown, pubescence..... 3.

2. Scape as long as third antennal segment; prothorax swollen on each side, feebly punctate; elytra barely swollen basally; apices obliquely emarginate-truncate, with external angles produced..... *cantonensis*.
Scape shorter than third antennal segment; prothorax coarsely rugose-punctate, medially carinate on disc; each elytron with a strong basal crest, besides a lesser, external crest, apices subobliquely truncate.
hookeri.
3. Pronotal disc irregularly carinate and sulcate; elytral bases coarsely rugose and swollen; elytral apices transversely emarginate-truncate, briefly dentate 4.
Pronotal disc with three longitudinal grooves separated by two regular grooves; elytral bases simply punctured, each with two feeble costæ; elytral apices deeply emarginate, with both angles strongly and equally produced *excisa*.
4. Pronotal disc medially grooved only on basal portion; elytral bases irregularly rugose; last abdominal sternite of male regularly rounded posteriorly *minor*.
Pronotal disc medially grooved for most of length; elytral bases each swollen near middle; last abdominal sternite of male emarginate-truncate with angles strongly produced..... *yanoi reducta*.

NIPHONA CANTONENSIS Gressitt.

Niphona cantonensis GRESSITT, Lingnan Sci. Journ. 18 (1939) 71, pl. 2, fig. 8, Canton, Kwangtung.

Male.—Small, slender, narrowed posteriorly. Body blackish to light reddish brown, clothed with tawny or whitish pubescence: head reddish brown, entirely clothed with tawny; antennæ reddish brown, scape and apices of following segments blackish brown, irregularly clothed with tawny on scape, briefly setose internally; prothorax reddish, darker on anterior border, densely clothed with tawny pubescence; elytra blackish brown basally, pale castaneous on remainder; largely clothed with tawny, a transverse band of white pubescence behind base and continued along sides nearly to apices; ventral surfaces blackish brown, in part reddish, clothed laterally with tawny pubescence.

Head closely punctured, feebly convex in front, barely concave between antennal tubercles. Antennæ nearly one and one-half times as long as body; scape subequal in length to third segment, both shorter than fourth. Prothorax short, swollen laterally, moderately punctured. Elytra long, obliquely emarginate-truncate apically, subseriately punctate.

Length, 11 millimeters; breadth, 3.1.

A single male was taken at Hoihow, northern Hainan, April 18, 1932.

New to Hainan Island. This specimen is considerably less rubbed than the type. This species is probably congeneric with

*Falsoniphona lutea*¹⁸ Pic, but I doubt the validity of the latter genus, described at the same time.

Distribution.—Kwangtung; Hainan.

NIPHONA EXCISA Pascoe. Plate 3, fig. 9.

Niphona excisa PASCOE, Journ. Ent. 1 (1862) 337, Cambodia.

Male.—Subcylindrical, slightly narrowed posteriorly. Body dark reddish brown, blackish brown on elytral bases and tarsi, unevenly clothed with dark brown or light tawny pubescence: head densely clothed with tawny on frons and vertex, genæ dark brown, occiput streaked; antennæ dark brown, first and fourth segments mottled brown and white; prothorax dark brown, striped with tawny along sides of disc; elytra dark brown, tawny at base near scutellum and on an irregular, oblique, suboval area behind middle of each, fringed apically; ventral surfaces clothed with tawny mixed with brown, subglabrous on abdomen.

Head deep and short, deeply punctured; vertex nearly plane; frons much broader above than beneath. Antennæ nearly as long as body; scape not quite as long as third segment; prothorax a little broader than long, moderately convex, trisulcate medially, subrugose laterally. Elytra sparsely punctured, each feebly bicostate basally and strongly emarginate and bispinose apically.

Length, 19.5 millimeters; breadth, 5.6.

A single specimen, in the Lingnan Natural History Museum, was taken at Chung-mei, Hainan, August 19, 1932, by F. K. To. New to Hainan.

Distribution.—Cambodia; Hainan.

NIPHONA HOOKERI Gahan.

Niphona hookeri GAHAN, Ann. & Mag. Nat. Hist. (7) 5 (1900) 351, Hainan, northern India, China; GRESSITT, Lingnan Sci. Journ. 18 (1939) 72, Kwangtung.

Male.—Dark reddish brown, blackish on head; almost entirely clothed with dense, whitish-buff pubescence, tawny on bases, and along middle portion of elytra; antennæ thinly clothed and dull distally.

Head deep, finely punctured; eyes large, inferior lobes transverse; antennæ a little longer than body; scape two-thirds as long as third segment; prothorax transverse, tricarinate me-

¹⁸ Mel. Exot. Ent. 44 (1925) 26, Tonkin.

dially, coarsely rugose-punctate on remainder of disc and on sides; elytra subparallel in basal two-thirds, distinctly narrowed and subobliquely truncated apically; disc of each irregularly punctured, a strong, subtuberculate ridge on base near scutellum and a lesser one near humerus.

Length, 10.7 millimeters; breadth, 3.4.

One single male, in the Lingnan Natural History Museum, taken at Nam-cha-chuen, near Nodaa, August 9, 1929, by the Lingnan Univ. Fifth Hainan Exped.

Distribution.—Hainan; Hongkong; Kwangtung; Sikkim; Andaman Islands.

NIPHONA MINOR (Lameere). Plate 4, fig. 3.

Ælara minor LAMEERE, Ann. Soc. ent. France 62 (1893) 284, Pnom-Penh, Cambodia.

Niphona minor AURIVILLIUS, Col. Cat. 73 (1922) 250.

Male.—Subparallel; dorsoventrally compressed. Body dark reddish brown to blackish brown, irregularly clothed with various shades of brownish and grayish-white pubescence: head clothed with rusty brown, mixed with tawny and grayish, pubescence; antennæ dark brown spotted with light brown and whitish; prothorax thinly clothed with light rusty brown, mixed with pale-gray hairs; elytra clothed with whitish gray on depressed areas and with light rusty brown on ridges and most of interpunctural spaces, a faint, pale zig-zag band behind middle; ventral surfaces grayish white along sternites, and mottled brown, rusty, and whitish along sides; legs whitish internally and mottled brown externally.

Head deeply and irregularly punctured; frons subparallel; vertex hardly concave; inferior eye lobes squarish, a little deeper than wide; antennæ slightly longer than body; scape not quite as long as third segment; prothorax short, with coarse rugæ arranged more or less as longitudinal ridges, an anteriorly converging pair at middle, elytra deeply punctured, irregularly rugose and subtricarinate basally; apices emarginate-truncate, briefly bidentate.

Length, 12.7 to 13.4 millimeters; breadth, 4 to 4.5.

Two males, in the Lingnan Natural History Museum and in the author's collection, were taken at Sam-ah-kong (Sam-a), Yai District, southern Hainan, February 1 to 3, 1935, by F. K. To.

New to Hainan.

Distribution.—Cambodia; Hainan.

NIPHONA YANOI REDUCTA Gressitt subsp. nov. Plate 7, fig. 4.

Male.—Moderately large; subparallel; narrowed preapically. Body blackish brown, slightly reddish in part, clothed with irregular patterns of whitish, gray, and tawny, pubescence: head clothed with grayish white, tawny and a little dark brown; antennæ largely of a rusty or tawny-brown, spotted or mixed with grayish white, particularly on third and following segments, apices ringed with tawny and then whitish; prothorax largely clothed with golden-tawny, mixed with grayish white; scutellum clothed with dark brown at sides, grayish medially, and golden-tawny posteriorly; elytra largely clothed with thin, grayish-white pubescence, many of interpunctural areas or ridges clothed with rusty orange-brown, whitish predominating along sides of central portion and obliquely across just behind middle; ventral surfaces whitish on sternites, with center of each subglabrous, sides rusty brown with whitish hairs mixed in; legs tawny-brown, mixed with grayish.

Head sparsely and irregularly punctured; frons slightly wider than high; inferior eye lobes small, wider than deep. Antennæ nearly as long as body; scape thick, almost longer than third segment; third segment a little shorter than fifth; fifth and following segments gradually decreasing. Prothorax one and one-third times as broad as long; disc coarsely subvermiculose, a pair of subnodose ridges along middle, converging not far from anterior margin, remainder irregularly swollen. Elytra subcoarsely and subseriately punctured; disc of each with a laterally compressed swelling near base and a small ridge between this and humerus; apices narrow, subemarginate-truncate, angles briefly dentate. Last abdominal sternite deeply emarginate-truncate, strongly produced ectoapically. Anterior tibiæ strongly dentate posteriorly before apices.

Length, 17.3 millimeters; breadth, 6.2.

Holotype, in the Lingnan Natural History Museum, Sam-ah-kong (Sam-a), Yai District, southern Hainan, January 30, 1935, F. K. To.

Differs from *N. yanoi*¹⁹ Matsushita in having the pronotal disc less grossly swollen on each side, the lateral margins less convex posteriorly; the elytral apices much abbreviated, with external angles not produced more than suture; the last abdominal sternite flatter, and with the ectoapical processes less produced.

Distribution.—Hainan Island.

¹⁹ Trans. Nat. Hist. Soc. Formosa 24 (1934) 240, Formosa.

Genus *PTEROLOPHIA* Newman

Pterolophia NEWMAN, Entomologist 1 (1842) 370; THOMSON, Syst.

Cer. (1864) 365; GAHAN, Ann. Mus. Civ. Genova 34 (1895) 66.

Prioneta BLANCHARD, Voy. Pole Sud Zool. 5 (1853) 292.

Preonetha PASCOE, Journ. Ent. 1 (1862) 348.

Frons subrectangular; vertex concave; eyes divided, subcoarsely faceted, inferior lobes more often wider than deep; antennæ generally shorter than body; scape, and third and fourth segments more or less equal in length; fourth segment often nearly as long as fifth and sixth segments combined; prothorax broader than long, evenly swollen at sides, nontuberculate, elytra narrowed and separately rounded or subangulate apically; mesosternal process nontuberculate.

Genotype.—*Pterolophia vitticollis* Newman.

Range.—Oriental, Oceanic, and eastern Palæarctic Regions.

Key to the Hainan species of Pterolophia.

1. Third and fourth antennal segments equal in length, fourth arched; scape noncarinate anteriorly; prothorax equally broad before and behind; elytra lacking distinct costæ as far as posterior declivities..... 2.
 Third antennal segment a little longer than fourth, fourth not distinctly arched; scape carinate anteriorly; prothorax broader anteriorly than at base; elytra subcostate from basal crests to beginning of posterior declivities 4.
2. Pronotum densely punctured; elytra with bases feebly swollen and apices separately rounded; inferior eye lobes large, fully as deep as wide, occupying one-half depth of side of head..... 3.
 Pronotum nearly impunctate; elytra with bases sharply crested and apices obtusely angulate; inferior eye lobes small, transverse.
cervina.
3. Posterior antennal segments of male acutely produced anteriorly at apices; elytra pinkish brown with a faint, oblique band on each at beginning of posterior declivity..... *arctofasciata*.
 Posterior antennal segments of male hardly produced endoapically; elytra rusty brown with large part of sides whitish and sutural portion of base pinkish *annulata*.
4. Inferior eye lobes small and subtransverse or obliquely oval, occupying one-half, or less, of space between antennal insertions and genal margins; elytral apices angulate; pronotal disc binodose..... 5.
 Inferior eye lobes large, deeper than wide, occupying over one-half space between antennal insertions and genal margins; elytral apices angulate; pronotal disc binodose *camela*.
5. Largely black, marked on prothorax, suture and sides of elytra with white; antennæ stout, white basally and beyond middle, remainder black; scutellum semicircular; body length more than 8 millimeters.
albonigra.

Largely brown, mottled and banded with grayish; antennæ slender, annulated with gray in distal half; scutellum squarish; body length less than 6 millimeters *kaleea*.

PTEROLOPHIA ALBONIGRA Gressitt sp. nov. Plate 4, fig. 5.

Female.—Somewhat abbreviated, parallel, strongly declivitous posteriorly, a raised ridge at top of declivity. Body black, partially clothed with white, and a little brown, pubescence: head moderately clothed with white and tan, denser at sides; clypeus and labrum brown; antennæ largely white and partly tan to middle of third segment, pure black on apical half of third segment, all of fourth and eighth to eleventh segments, white on fifth to seventh segments; prothorax white along middle of disc and upper parts of sides, remainder largely dirty tan; scutellum brown, margined laterally with white and apically with yellowish tan; elytra largely black, an oblique white band on each side from middle of external margin to posterior callus; extreme base, basal callus, suture, and sutural half of apical portion, white mixed with tan; ventral surface and legs largely whitish mixed with tan.

Head weakly concave between antennal insertions, sparsely punctured; frons broader than high; inferior lobe of eye much shorter than its distance from mandibles. Antennæ reaching slightly beyond middle of elytra; scape distinctly carinate on three sides, equal in length to third segment; fourth segment two-thirds as long as third, both weakly carinate externally. Prothorax broader than long, weakly swollen at sides, densely and finely punctured. Scutellum rounded behind. Elytra subparallel, narrowed and obliquely subtruncate apically, grossly and deeply punctured, bearing two more or less distinctly raised ridges, inner ridge more strongly raised and bearing suberect hairs near base and at top of declivity.

Length, 9 millimeters; breadth, 3.4.

Holotype, female, loan deposit, California Academy of Sciences, Ta-hian, near Five Finger Mountains, southcentral Hainan Island, altitude 600 meters, June 19, 1935, taken by the author.

Differs from *P. annulata* Chevr. in being much shorter, black instead of brown, the pinkish brown pubescence largely replaced by white, the sides of the elytra only partly white, and the middle and apical portions of antennæ black with the rest white.

Distribution.—Hainan Island.

PTEROLOPHIA ANNULATA (Chevrolat).

Coptops annulata CHEVROLAT, Rev. Zool. 8 (1845) 99, Macao, near Hongkong.

Praonetha Bowringii PASCOE, Trans. Ent. Soc. London (3) 3 (1865) 170, Hongkong.

Pterolophia annulata GAHAN, Ann. Mus. Civ. Genova 34 (1895) 69; Ann. & Mag. Nat. Hist. (7) 5 (1900) 352, Hainan; GRESSITT, Lingnan Sci. Journ. 18 (1939) 73.

Pterolophia bowringii AURIVILLIUS, Col. Cat. 73 (1922) 253; MATSU-SHITA, Journ. Fac. Agr. Hokkaido Imp. Univ. 34 (1933) 260.

Male.—Body reddish brown, clothed with dark brown, rusty, pinkish, or grayish-white pubescence: head rusty, with scattered pale hairs, dark brown at sides; antennæ rusty on scape, dark brown on third segment, following segments grayish or tawny proximally and darker brown distally; prothorax dark brown at sides, median portion of disc with a pair of pinkish-tawny stripes commencing at both apex and base, intervening area faintly mottled; elytra rusty brown basally and apically, sides grayish white, sutural portion of bases tawny or pinkish brown; ventral surfaces tawny, mixed with grayish buff and spotted with dark brown.

Antennæ fourth-fifths as long as body; scape, and third and fourth segments subequal in length. Prothorax nearly as long as broad, feebly convex laterally. Elytra with surfaces coarsely foveate-punctate, around the feebly swollen basal callosities; apices subrounded.

Length, 10 to 12 millimeters; breadth, 3.3 to 4.

Female.—Antennæ two-thirds as long as body, posterior segments hardly dentate endoapically.

Length, 14 millimeters; breadth, 4.8.

One male, in the British Museum, was collected on Hainan by J. Whitehead in 1899; 2 males, in the Lingnan Natural History Museum, were taken at Ch'ung-mei, 25 kilometers southeast of Naam-fung, Lin-kao District, August 27 and 28, 1932, by F. K. To; 1 female, in the author's collection, was taken at Tai-pin-ts'uen (Dwa-Bi) by the author, July 25, 1935; 1 female, Samkwong-ts'uen, Lam-wan-tung, August 16, 1935, F. K. To.

Distribution.—Hongkong; Kwangtung; Kiangsu; Hainan; Formosa; Ryu Kiu Islands; Burma.

PTEROLOPHIA ARCTOFASCIATA Gressitt sp. nov. Plate 4, fig. 6.

Female.—Moderate-sized; laterally compressed; strongly declivitous posteriorly. Reddish brown, entirely clothed with dense

pubescence varying from light tan to blackish: head blackish brown, mottled with reddish brown and isolated white hairs; antennæ blackish brown from base to end of basal third of fourth segment, middle of fourth segment reddish, remaining segments brown with scattered whitish hairs and base of each segment pale; prothorax dark brown, pinkish on each side of midline of disc from base to apex as well as on lower parts of sides; scutellum and basal quarter of elytra pinkish red, basal crest black-tipped, an oblique brown portion beyond basal part, then a light reddish-brown triangular area on each side; margined posteriorly with light tan, forming a narrow, slightly sinuous line from posterior callus to margin, leaving the triangular apical area brown mixed with pinkish, some black spots along suture in middle and posterior region; ventral surface and legs largely pinkish brown, last abdominal segment and tarsi dark brown, middle of metasternum gray-brown.

Head moderately concave between antennal insertions, heavily punctured on occiput, less so on frons. Antennæ reaching almost to apical third of elytra; scape thick, equal in length to third segment; fourth segment slightly arched, nearly as long as third, twice as long as fifth segment. Prothorax slightly broader than long, narrower apically, densely punctured, each puncture giving rise to a white hair. Scutellum rounded-triangular. Elytra slightly narrowed posteriorly, strongly declivitous, separately rounded-subangulate apically; surface bearing a weak callus near base and another at beginning of last third, near suture, the latter bearing a longer tuft of hairs.

Length, 10.7 to 11.6 millimeters; breadth, 4.

Male.—Antennæ five-sixths as long as body, posterior segments acuminate dentate endoapically.

Length, 10 millimeters; breadth, 3.2.

Holotype, female, No. 52173 United States National Museum, Ta-hian, near Five Finger Mountains, southcentral Hainan Island, altitude 600 meters, June 12, 1935, taken by the author; allotype, male, in the Musée Heude, Nodda, Hainan, March 23, 1936, G. Ros; two paratypes, 1 female, in the Lingnan Natural History Museum, Dwa-Bi (Tai-pin), July 20, 1935, and 1 male, in the author's collection, Ta-han, June 21, 1935, taken by the author; one paratype, taken at Sam-a (Sam-ah-kong), April 30, 1936, by G. Ros; one at Ying-ko-au, June 25, 1935, F. K. To; and one en route from Paai-poon-ts'uen, Yai District, to Faan-maan-ts'uen, Ling-shui District, May 11, 1932, by R. A. McClure.

This species differs from *P. annulata* (Chevr.) in being a little smaller, narrower at humeri, with the posterior antennal segments of the male acutely produced endoapically and the elytra with a narrow, curved, pale fascia at top of posterior declivity, instead of with the sides largely clothed with whitish-gray pubescence.

Distribution.—Hainan Island.

PTEROLOPHIA CAMELA Pic.

Pterolophia camela PIC, Mel. Exot. Ent. 45 (1926) 30, Tonkin.

Male.—Small; narrow; tuberculate on pronotum and bases of elytra. Body reddish brown, darker brown on elytra, clothed with various shades of brown, with some grayish white, and black, pubescence: head tawny-brown, a little whitish on genæ, sides of lower part of frons and sides of vertex; antennæ rusty brown mixed with dark brown and grayish on first four segments, following segments each rusty brown basally, dark brown in middle, grayish at extreme apex; prothorax tawny-brown, with indefinite longitudinal stripes and areas on disc; elytra tawny-brown, mixed with grayish white, marked with brownish black on humeri, basal crests, and along sutural third to beyond middle, some incomplete, suboblique, grayish bands at suture before and after beginning of posterior declivity, edged with tawny and separated by some black spots; ventral surfaces thinly clothed with whitish mixed with pale buff, some dull-brown spots on legs and apex of abdomen.

Head finely punctured; inferior eye lobes large; antennal supports prominent. Antennæ three-fourths as long as body; scape slender, tricarinate, a little longer than third segment. Prothorax short, finely punctured, constricted basally, bituberculate on center of notal disc. Elytra prominently crested basally, carinate from crest to beginning of posterior declivity, seriate-punctate, obliquely truncate apically, concave along center of disc of each.

Length, 6.5 millimeters; breadth, 2.6.

A single male, in the Lingnan Natural History Museum, taken at Ngaai-uen city, Yai District, southern Hainan, January 31, 1935, by F. K. To.

New to Hainan.

Distribution.—Tonkin; Hainan.

PTEROLOPHIA CERVINA Gressitt.

Pterolophia cervina GRESSITT, Lingnan Sci. Journ. 18 (1939) 74, pl. 2, fig. 6, Kwangtung and Kwangsi.

Male.—Body dark brown, lighter reddish brown on elytra and parts of ventral surfaces, clothed with tawny-brown, and a little dark brown, pubescence: head pale tawny, streaked with dark on each side of occiput; antennæ buff with spots on scape and central portions of fifth and following segments brownish; prothorax whitish buff with a large dark-brown spot on each side of base of notum; elytra tawny-buff, with several faint, posteriorly arcuate, darker bands on base and middle, the last considerably broadened towards lateral margins; thoracic sterna and legs tawny-buff spotted with dull brown; abdomen thinly clothed with whitish buff with reddish-brown spots, posterior margins of segments densely fringed.

Head sparsely and finely punctured; antennal supports sub-tuberculate internally; antennæ nearly as long as following two segments united; prothorax one and one-fifth as broad as long, evenly swollen and sparsely punctured; elytra roughly crested subbasally, seriate-punctate on inner half of basal portion of each; apices subobtuse.

Length, 10 millimeters; breadth, 3.8.

A single male, in the Lingnan Natural History Museum, taken at lights at Nodoa, August 15, 1929, by the Lingnan Univ. Fifth Hainan Island Exped.

New to Hainan.

Distribution.—Kwangtung; Hainan.

PTEROLPHIA KALEEA (Bates). Plate 5, fig. 5.

Praonetha kaleea BATES, Proc. Zool. Soc. London (1866) 351, Formosa.

Pterolophia kaleea AURIVILLIUS, Col. Cat 73 (1922) 254.

Pterolophia kaleca MATSUSHITA, Journ. Fac. Agr. Hokkaido Imp. Univ. 34 (1933) 359, 361 (error).

Female.—Dark brown, somewhat reddish beneath, irregularly clothed with grayish white, tawny, rusty, and blackish pubescence: head tawny-brown with several incomplete transverse or oblique whitish bands; antennæ dark brown, banded with grayish white at middle and apex of scape, base of third, bases and apices of fourth to eighth, and bases of following, segments; prothorax dull brown, in part tawny, largely suffused with grayish white on sides and onto disc as far as each side of center, and, more distantly, each side of base; elytra dull brown mixed with darker brown and dotted with blackish brown, marked with grayish white as follows: a small spot on each side of suture behind parascutellar tawny spots, a broad, irregular, premedian,

and a narrow postmedian, band, fusing at sides into a large whitish area, and some irregular, subcoalesced spots, particularly on dorsal portion of apical quarter, suture broken up into sub-regular, rusty, dark-brown, and whitish, bars, a pale rusty spot on each side of suture at top of apical declivity; ventral surfaces thinly clothed with grayish white, some tawny hairs on abdomen; legs with irregular whitish pubescence.

Head deeply punctured; inferior eye lobes oval, oblique; antennæ three-fourths as long as body; scape slender, a little longer than third segment. Prothorax nearly one and one-third as broad as long, feebly swollen laterally, with surfaces closely and deeply punctured and slightly convex on each side of center of disc. Elytra parallel for basal two-thirds, narrowed and sub-rounded apically; surfaces closely, and in large part seriately, punctured; basal crest short, a feeble ridge extending from it to top of apical declivity.

Length, 5.6 millimeters; breadth, 2.

A single female, in the author's collection, taken by the author at Tai-pin-ts'uen (Dwa-Bi), near Loi Mother Mountain, Hainan, July 25, 1935.

New to Hainan.

Distribution.—Formosa; Hainan.

Genus *LYCHROSIS* Pascoe

Lychrosis PASCOE, Journ. Linn. Soc. London Zool. 9 (1866) 89; LA-CORDAIRE, Gen. Col. 9 (1872) 522, 541.

Frons slightly broader above than beneath; vertex shallowly concave; eyes finely faceted, inferior lobes wider than deep; antennæ about as long as body in male, shorter in female, third segment longer than scape; prothorax subcylindrical, broader than long; elytra lacking distinct basal crests, declivitous posteriorly, separately acuminate apically; middle intercoxal process nontuberculate; tarsi about as long as tibiæ.

Genotype.—*Mycerinus luctuosus* Pascoe.

Range.—Indo-Chinese Subregion; Queensland.

Key to the Hainan species of Lychrosis.

Frons wider than high; third antennal segment no longer than fourth; grayish white with a large humeral spot and a postmedian band, on elytra, of blackish; body less than 12 millimeters long..... *fasciatus*.

Frons higher than wide; third antennal segment longer than fourth; white, striped and spotted with black; body over 13 millimeters long.

zebrinus.

LYCHROSIS FASCIATUS Gressitt sp. nov. Plate 4, fig. 4.

Male.—Brownish black, largely clothed with gray, white, tawny, or dark-brown pubescence: head with grayish white, mixed on vertex and upper part of frons with a little tawny, pubescence; antennæ thinly clothed with grayish white on first five segments, and with grayish brown on remainder; prothorax clothed with grayish white, somewhat tawny anteriorly and on middle of disc, more whitish basally and at sides, finely and sparsely dotted with blackish; scutellum thinly clothed with whitish; each elytron with a large, subrectangular, dark-brown spot on outer two-thirds of basal quarter, somewhat rusty on humeri; remainder of base, and sutural portion slightly beyond base, pale tawny; premedian areas forming a broad, transverse, white band, postmedian area, for nearly equal width, brownish black; somewhat tawny at sides, apical quarter pale tawny to whitish, dotted with dark brown; ventral surfaces clothed with white on thorax and pale buff on abdomen, segments of latter fringed on posterior margins; legs thinly clothed with white.

Head closely and finely punctulate; vertex slightly concave. Antennæ not quite as long as body; scape thick, nearly as long as third segment; fourth segment subequal to third and nearly as long as fifth and sixth segments combined. Prothorax subcylindrical, a little broader than long, hardly convex at sides, evenly swollen on disc; surfaces finely and closely punctured. Scutellum short, convex behind. Elytra slightly broadened to just behind middle, narrowed posteriorly; apices separately produced and subacute; surfaces deeply subseriate-punctate, two feeble costæ extending from base to beginning of posterior declivity, on each. Metasternum with a few deep punctures at sides.

Holotype, length, 9.4 millimeters; breadth, 3.6.

Paratype, length, 8 millimeters; breadth 3.2.

Female.—Antennæ four-fifths as long as body; elytra more swollen posteriorly, with three more or less distinct costæ.

Length, 11 millimeters; breadth, 4.2.

Holotype, male, in the Lingnan Natural History Museum, Taai-chau Island (Tinhosa), Wan-ning District, off southeastern Hainan, June 2, 1932, collected by Prof. W. E. Hoffmann and O. K. Lau; allotype, 1 female, Nos. 53457 and 53475, United States National Museum, and paratype, male, in the author's collection, taken the same day.

Differs from *L. zebrinus* (Pascoe) in being shorter and more broadened posteriorly, in having the frons much broader, the

antennal scape stouter, the third antennal segment relatively shorter, the pronotum more swollen, the elytra more regularly punctured, subcostate, and a little less produced apically, besides being clothed with duller white and banded, instead of spotted and striped, with black. Possibly near *L. rufipennis* Pic, but the elytra are not red and have a definite pattern of pubescence, and the prothorax is broader than long.

Distribution.—Hainan Island.

LYCHROSIS ZEBRINUS (Pascoe). Plate 3, fig. 10.

Hathlia zebrina PASCOE, Trans. Ent. Soc. London (2) 4 (1857) 252, India.

Lychrosis zebrinus LACORDAIRE, Gen. Col. 9 (1872) 541.

Male.—Black, partially clothed with thick, white pubescence: head white with four longitudinal black stripes on top, middle two stripes very close, a few blackish dots on genæ, and some grayish areas on frons; antennæ with last seven segments black except at bases and apices, fourth segment dark just before apex; prothorax white with five black stripes; elytra white with irregular, subreticulate, black markings, particularly along dorsal portion, and crossing suture as broken or transverse bands; ventral surfaces and legs white with grayish-black dots.

Head deep, feebly concave at vertex. Antennæ barely as long as body; scape long, subcylindrical, carinate anteriorly, not quite as long as third segment. Prothorax nearly cylindrical, hardly swollen above or at sides, rather closely and deeply punctured. Elytra grossly punctured.

Length, 12.5 millimeters; breadth, 4.8.

Female.—Antennæ five-sixths as long as body.

Length, 14.7 millimeters; breadth, 5.6.

One male was taken at Ta-han, central Hainan, altitude 750 meters, June 21, and 1 female at Tai-pin'ts'uen (Dwa-Bi), near Loi Mother Mountain, altitude 400 meters, July 24, 1935, by the author. The Lingnan Natural History Museum has specimens from between Nam-fung and Poh-shang, July 24, and Fan-ta-ts'uen, July 31, 1929, Lingnan Univ. Fifth Hainan Exped.; Chengmai, August 24, 1932, and Tai-pin-ts'uen, July 25, 1935, F. K. To.

New to Hainan.

Distribution.—Northern India; Tonkin; Hainan; Formosa.

Genus *DESISA* Pascoe

Desisa PASCOE, Trans. Ent. Soc. London (3) 3 (1865) 163; LACORDAIRE, Gen. Col. 9 (1872) 551, 566.

Body depressed; frons squarish; vertex feebly concave; eyes emarginate, coarsely faceted, inferior lobes about as wide as deep; antennæ a little longer than body in male, about as long as body in female, scape broadened apically, as long as third segment; prothorax short, narrowest at base; elytra broad, rounded apically; intercoxal process nontuberculate.

Genotype.—*Praonetha subfasciata* Pascoe.

Range.—India; Indo-China; Hainan; South China; Formosa.

DESISA SUBFASCIATA (Pascoe).

Praonetha subfasciata PASCOE, Journ. Ent. 1 (1862) 348, Cambodia.

Desisa subfasciata PASCOE, Trans. Ent. Soc. London (3) 3 (1865) 163;

LACORDAIRE, Gen. Col. 9 (1872) 566; GRESSITT, Lingnan Sci. Journ. 18 (1939) 76.

Female.—Dull reddish brown, somewhat blackish on pronotal disc, scape, and parts of femora and tibiæ, clothed with irregular, dull-brown or grayish pubescence: head grayish brown, with a few scattered tawny spots; antennæ thinly clothed with dull brown, some tawny on scape, bases of fourth and following segments pale gray; prothorax dull brown, with some irregular tawny blotches; elytra grayish brown, spotted with tawny, a broad, but faint, grayish-white band centered slightly before middle; ventral surfaces buffy white along middle and with tawny spots along sides.

Antennæ about as long as body; scape broad apically, hardly longer than third segment; prothorax transverse, broadened anteriorly, irregularly punctured; elytra broad, subparallel, rounded apically, distinctly punctured, subasperately punctured at base.

Length, 10.8 millimeters; breadth, 4.4.

A single female, in the Lingnan Natural History Museum, taken at Tai-tsing-lam-ts'uen, back of Lai-mo-ling (Loi Mother Mountain), Ting-an District, June 5, 1935, by F. K. To.

New to Hainan.

Distribution.—Cambodia; South China; Hainan.

Genus ENISPIA Pascoe

Enispia PASCOE, Trans. Ent. Soc. London (3) 3 (1864) 28, 50; LACORDAIRE, Gen. Col. 9 (1872) 552, 575.

Dyemus PASCOE, Trans. Ent. Soc. London (3) 3 (1864) 28, 54.

Subcylindrical, hairy. Antennæ distantly inserted, tapering, not much longer than body, with long internal hairs, segments

Female.—Antennæ one and one-third as long as body.

Length, 4 to 4.8 millimeters; breadth, 1.6.

Holotype, male, in the Lingnan Natural History Museum, Tai-tsing-lam-ts'uen, back of Lai-mo-leng (Loi Mother Mountain), central Hainan, June 13 to 16, 1935, F. K. To; allotype, female, in the author's collection, Tai-pin (Dwa-Bi), near Loi Mother Mountain, July 20, 1935, taken by the author.

Differs from *E. venosa* Pascoe in having the antennæ less distinctly annulated, the elytra dark with pale zig-zag fasciæ instead of being distinctively marked with yellow, gray, white, and brown. Differs from *E. setosa* Gressitt in having the body hairs shorter and sparser, the elytral punctures denser and less regular, and the markings much less striking.

Distribution.—Hainan Island.

ENISPIA QUADRISTIGMA Gressitt sp. nov. Plate 4, fig. 12.

Male.—Dark brownish black; third and following antennal segments ringed basally with white for successively increasing lengths; pronotum with a pair of incomplete longitudinal stripes of tawny-brown on each side of middle; scutellum tawny on each side; elytra with a very small white spot near midline of each at end of basal third, and an incomplete, narrow, irregular, oblique fascia at beginning of apical third, largely tawny except for the middle portion on each elytron, which forms an oblique white spot and a narrow, incomplete, tawny fascia just before apex; dorsal surface dotted with short, white, recumbent hairs; ventral surface clothed with thin gray pubescence; body largely clothed with suberect hairs, dark above and whitish beneath.

Head nearly plane between antennal insertions, feebly convex in front, deeply punctured except on occiput; eyes with inferior lobes barely deeper than wide. Antennæ one and one-fourth as long as body, tapering; scape thick, subcylindrical, about as long as third segment; fourth segment slightly longer than third; following segments slightly shorter. Prothorax fully as broad as long, uneven above. Elytra deeply punctured in about eight rows. Ventral surfaces impunctate; posterior femora not reaching fourth abdominal segment.

Length, 6.3 to 7.2 millimeters; breadth, 2.1 to 2.5.

Holotype, male, in the Lingnan Natural History Museum, Sam-ts'uen-kai-hui, southeast of Lai-mo-leng, central Hainan, July 4 to 6, 1935, F. K. To; paratype, male, in the author's collection, Fan-ta, southeast of Nam-fung, altitude 300 meters, July 17, 1935, taken by the author.

Differs from *E. anfracta* Gressitt in being larger, black, with small tawny or white spots, the antennæ more annulated, and in other respects.

Distribution.—Hainan Island.

ENISPIA THOLANA Gressitt sp. nov. Plate 4, fig. 11.

Female.—Dark reddish brown, nearly black on femora and ventral surface; largely clothed with yellowish buff, brown, or grayish pubescence as follows: head mottled with golden-buff and brown in front and above, and with gray at sides; antennæ thinly clothed with gray-brown, some golden-buff on scape; prothorax clothed with golden-buff, partly in longitudinal stripes, and spotted with small dark-brown dots; elytra largely golden-buff of brighter and duller shades, bases grayish, an area along middle, and two oblique areas before apex of each, thinly pubescent and reddish brown, the brighter golden areas in the form of three or four zig-zag fasciæ, the most distinct and acute fascia near beginning of apical third; ventral surface thinly and evenly clothed with gray-brown, posterior margins of abdominal segments narrowly edged with golden-buff. Entire body clothed with moderately long, erect hairs, brown above, pale on underparts.

Head barely as wide as prothorax, plane in front, distinctly punctured; vertex oblique, very slightly depressed; frons much wider than deep; eyes small, deeply emarginate, inferior lobes deeper than wide. Antennæ barely longer than body, strongly tapering; scape subcylindrical, punctate, shorter than fourth and longer than third, segment; fourth segment nearly as long as fifth and sixth segments combined. Prothorax broader than long, constricted near base and apex, slightly swollen at middle; surface with shallow, but distinct, punctures. Scutellum short, rounded behind. Elytra moderately broad, convex, conjointly rounded apically; deeply punctured, in ten or eleven rows at middle of each. Posterior femora barely reaching fourth abdominal segment.

Length, 7 millimeters; breadth, 2.8.

Holotype, female, loan deposit, California Academy of Sciences, Dome Mountain (Sa-ko-lia, Sa-bo-leng), southwest of Nodua, westcentral Hainan, altitude 450 meters, July 12, 1935, taken by the author.

Differs from *E. setosa* Gressitt in having a more swollen and shorter prothorax, broader and more convex elytra which are more sparsely and more regularly punctured, shorter setæ, par-

ticularly on antennæ, less contrasting markings, a less distinct pattern, and in other characters.

Distribution.—Hainan Island.

Genus PHESATES Pascoe

Phesates PASCOE, Trans. Ent. Soc. London (3) 3 (1865) 155; LACORDAIRE, Gen. Col. 9 (1872) 552, 571.

Head broad, evenly convex in lateral outline; frons broad, emarginate laterally; vertex nearly horizontal between antennal insertions; eyes coarsely faceted, emarginate, occupying most of space between antennal insertions and genal margins; antennæ hardly as long as body, slender; scape subcylindrical, a little shorter than third segment; third and fourth segments subequal; prothorax broader than long, convex and briefly toothed postmedially at sides; elytra but slightly broader than prothorax, rounded apically; mesosternal process very broad anteriorly, subtriangular; femora pedunculate-clavate.

Genotype.—*Phesates ferrugatus* Pascoe.

Range.—Borneo; Hainan; Hongkong; South China; India.

PRESATES MARMORATUS Gressitt sp. nov. Plate 4, fig. 13.

Depressed-cylindrical, narrowed posteriorly. Reddish brown, blackish on disc of prothorax and base and postmedian parts of elytra, partially clothed with tawny and grayish-white hairs: head quite densely clothed with tawny on upper portion of frons and on vertex, grayish on genæ; antennæ reddish, with bases of third to last segments thinly clothed with pale hairs, basal segments finely ciliated below; prothorax irregularly tawny on anterior portion of disc and upper parts of sides before tubercles, lower sides gray, remainder sparsely clothed; scutellum reddish; elytra irregularly mottled with tawny and gray, the former predominating on basal two-thirds, the latter at apex and along suture; ventral surfaces largely clothed with grayish, some tawny at sides; femora dull red-brown, sparsely gray-haired.

Head nearly level between antennal insertions, sparsely punctured; inferior lobes of eyes nearly reaching bases of mandibles. Antennæ five-sixths as long as body, finely tapered towards apices; scape subcylindrical, three-fourths as long as fifth. Prothorax broader than long, flattish above, briefly tuberculate behind middle of each side, deeply punctured. Scutellum small, semicircular. Elytra gradually narrowed, separately rounded apically, punctured in six regular longitudinal rows, with irreg-

ular rows of punctures in the interspaces. Ventral surfaces very sparsely punctured. Femora very strongly swollen, first segment of hind tarsus shorter than following two segments combined.

Length, 6.5 to 9 millimeters; breadth, 2.2 to 2.8.

Holotype, male, No. 53624 United States National Museum, Tai-pin-ts'uen (Dwa-Bi), altitude 380 meters, near Loi Mother Mountain, central Hainan, July 25, 1935, taken by the author; allotype, female, in the author's collection, Ta-hau, western Hainan, altitude 220 meters, July 7, 1935, taken by the author; paratypes, in the Lingnan Natural History Museum, a grove east of Nodoa, August 12, 1929, Lingnan Univ. Fifth Hainan Expedition, Kachek, eastern Hainan, altitude 25 meters, May 1 to 5, 1932, F. K. To; paratype, female, in the Musée Heude, Sam-a, southern Hainan, May 7, 1936, G. Ros; paratype, female, in the California Academy of Sciences, Hongkong, Koebele; paratype, female, in the Lingnan Natural History Museum, Yam-na Shan (Yim-na San), Mei District, Kwangtung Province, South China, September 20, 1933, F. K. To; paratype, female, Canton, Kwangtung, March 6, 1933, W. E. Hoffmann.

Differs from *P. ferrugatus* Pascoe in having the prothorax less cylindrical and the elytra mottled instead of uniform in pattern.

Distribution.—Hainan; Hongkong; South China.

Tribe APOMEYCYNINI

APOMEYCYNIDES Lacordaire, Gen. Col. 9 (1872) 413, 579.

APOMEYCYNINI Aurivillius, Col. Cat. 73 (1922) 278.

Frons rectangular; vertex concave; eyes emarginate or divided; antennæ rarely longer than body; prothorax cylindrical, nontuberculate; elytra narrow, parallel; mesosternal intercoxal process simple; middle coxal cavities open externally; middle tibiæ grooved externally; tarsal claws divergent.

Key to the Hainan genera of Apomecynini.

1. Eyes coarsely faceted; third antennal segment not shorter than fourth or scape 2.
 Eyes finely faceted; third antennal segment much shorter than either scape or fourth segment *Eunidia*.
2. Eyes completely divided; scape subcylindrical, about as long as third antennal segment; third and fourth segments together much shorter than remaining segments combined 3.
 Eyes deeply emarginate or almost divided; scape swollen, shorter than third antennal segment; third and fourth segments together about as long as remaining segments combined *Apomecyna*.

3. Prothorax as long as broad; eyes divided into distant lobes, inferior lobes in a depression, strongly convex; head nonretractile; elytra produced apically *Iproca*.
 Prothorax broader than long; eyes divided into subadjacent lobes, inferior lobes not strongly convex nor lying in a depression; head subretractile; elytra blunt apically *Ropica*.

Genus APOMECCYNA Latreille

Apomeccyna LATREILLE in Cuvier, Regne Anim. ed. 2 5 (1829) 126;
 LACORDAIRE, Gen. Col. 9 (1872) 580.

Mecynapus THOMSON, Archives Ent. 2 (1858) 187, note 1.

Antennæ short and thick; scape swollen; third and fourth segments relatively long; vertex moderately concave between antennal insertions; a deep pit below the small, deeply emarginate eyes; prothorax swollen, rough, nontuberculate; elytra subparallel, rough; legs short and thick; last segment of tarsus large.

Genotype.—*Lamia alboguttata* Megerle.

Range.—Africa; Asia; Oceania.

Key to the Hainan species of *Apomeccyna*.

- Length under 8 millimeters; prothorax longer than broad; each elytron with three oblique rows of white spots..... *quadrifasciata*.
 Length over 10 millimeters; prothorax broader than long; elytra with two broad, incomplete fasciæ of more or less isolated white spots, and a third, narrow spot before apex..... *cantator excavaticeps*.

APOMECCYNA QUADRIFASCIATA Thomson. Plate 5, fig. 1.

Apomeccyna quadrifasciata THOMSON, Physis 2 (1868) 159.

Female.—Brownish black, marked above with spots of white pubescence: four on pronotum; one on each side of disc; two sublinear spots, at apex and base, respectively, of midline; about twelve on each elytron, arranged in three oblique lines with some irregularly placed spots near apex; surface of body largely clothed with thin, dull-brown pubescence; some light areas on sides of abdominal segments.

Vertex subrounded-concave between antennal insertions; antennæ thickened apically, slightly more than one-half as long as body; scape one-half as long as third segment; prothorax one and one-fourth as long as broad, cylindrical, heavily punctured; elytra narrow, obliquely emarginate-truncate at apices; surfaces deeply punctured in eleven longitudinal rows; hind femora weakly swollen, not quite reaching to end of third abdominal segment.

Length, 6.6 millimeters; breadth, 1.6.

Three specimens, in the Musée Heude, were taken at Sam-a, southern Hainan, April 8 to 14, 1936, and at Yuan-men-tung, Hainan, April 8, 1936, by G. Ros.

New to Hainan.

Distribution.—Philippines; Laos; Hainan; Formosa.

APOMECYNA CANTATOR EXCAVATICEPS Pic comb. nov. Plate 4, figs. 9 and 10.

Apomecyna excavaticeps Pic, Mel. Exot. Ent. 28 (1918) 6, China.

Male (Plate 4, fig. 9).—Dark reddish brown, blackish brown beneath, clothed with moderately dense, chocolate-brown pubescence, varied with buff; elytra with two fairly broad, and one narrow, irregular fasciæ, first two fasciæ centered near ends of first and second thirds, respectively, last fascia just before apex, composed of separate, round spots of dense, white pubescence; first fascia of each elytron composed of about nine subequal spots in a W-shaped arrangement when viewed from side, touching neither suture nor margin, the second composed of a few large and several small spots, some closely approaching suture and margin, the third composed of three to five spots arranged subtransversely.

Head broadly subrounded-concave between antennal insertions; antennæ three-fourths as long as body; scape two-thirds as long as third segment; prothorax broader than long, weakly rounded at sides, deeply punctured; elytra narrowed and subobliquely truncate apically, punctured heavily near base, and more finely, in ten rows, posteriorly; hind femora reaching nearly to apex of fourth abdominal segment.

Length, 10.6 millimeters; breadth, 3.3.

Female (Plate 4, fig. 10).—Vertex more narrowly concave between antennal insertions; antennæ slightly exceeding middle of body; prothorax and elytra much more heavily punctured and rougher; brown pubescence irregularly varied with grayish white; white spots of elytral markings largely fused, last fasciæ more transverse than in male.

Length, 11 millimeters; breadth, 3.3.

One male, in the Musée Heude, was taken at Yuan-men-tung, Hainan, April 9, 1936, and 1 female, at Sam-a, May 3, 1936, both by G. Ros; 1 female, in the Lingnan Natural History Museum, collected at Hoihow, May 16 to 19, 1932, by O. K. Lau.

New to Hainan.

Distribution.—South China; Hainan; Formosa.

Genus *ROPICA* Pascoe

Ropica PASCOE, Trans. Ent. Soc. London (2) 4 (1857) 247; *ibid.* (3) 3 (1866) 187; LACORDAIRE, Gen. Col. 9 (1872) 590.

Head deeper than wide; frons rectangular, higher than wide; convex; vertex shallowly concave; eyes subcoarsely faceted, divided, lobes not greatly separated; antennæ tapering, a little longer than body, with scape and third and fourth segments subequal in length; prothorax broader than long, convex laterally; elytra broadest behind middle, separately rounded or subobtusely apically; mesosternal intercoxal process narrow and simple.

Genotype.—*Ropica piperata* Pascoe.

Range.—Oriental Region; Indo-Australian Subregion; Melanesia.

Key to the Hainan species of Ropica.

1. Inferior eye lobes occupying about one-half space between antennal supports and genal angles; antennæ relatively stout, with but few minute erect hairs distally; elytra lacking glabrous areas..... 2.
Inferior eye lobes occupying less than one-half space between antennal supports and genal margins; antennæ very slender, with numerous distinct, erect hairs distally; elytra with some glabrous areas.
ngauchiliæ.
2. Prothorax one and one-third as broad as long; elytra lacking distinctly raised longitudinal lines, irregularly punctured along suture; inferior eye lobes as wide as deep; pubescence not distinctly striped longitudinally, an arcuate whitish mark behind middle of each elytron.
formosana dorsalis.
- Prothorax nearly as long as broad; each elytron with two fairly distinct costæ along upper portion of disc, striate-punctate along suture; inferior eye lobes deeper than wide; pubescence more or less striped longitudinally *sublineata.*

ROPICA SUBLINEATA Gressitt sp. nov. Plate 5, fig. 9.

Male.—Narrow, subcylindrical. Body largely dull reddish brown; blackish on neck, across middle portion of prothorax, along median area of each elytral disc from humerus to beyond middle, and blackish brown on femora, apices of tibiæ, and central portions of posterior abdominal segments; surfaces clothed with pale gray, tawny, or various shades of brown, pubescence: head tawny, finely speckled with dark brown; antennæ reddish brown, thinly clothed with pale gray, irregularly on apical segments; prothorax with three longitudinal tawny stripes along middle and joined at apex and base, remainder dark, very thinly clothed with gray; scutellum with pale gray at sides; elytra thinly clothed with gray-brown, each with a tawny stripe on

basal quarter near suture, the two raised costæ each partly grayish white and partly dark brown, with some minute gray spots along suture and sides as well as near apices; ventral surfaces pale gray, somewhat tawny along sides; first abdominal segment with a tawny-buff apical fringe.

Head finely punctured; vertex feebly concave; inferior eye lobes a little deeper than wide. Antennæ one and one-fifth as long as body; scape slightly depressed, rugose-punctate, no longer than third segment; fourth segment as long as third; third to sixth segments feebly thickened apically. Prothorax nearly as long as broad, feebly convex laterally, slightly constricted at apex and base; surfaces finely punctured. Elytra narrow, hardly broadened posteriorly, separately rounded apically; disc of each subregularly punctured in about 17 longitudinal rows, with two raised costæ along dorsal portion from base to near apex where they meet. Thoracic sterna distinctly punctured at sides. Abdomen with last three segments subequal in length, longer than second.

Length, 7.6 millimeters; breadth, 2.4.

Female.—Antennæ barely longer than body; elytral costæ less distinct; last abdominal segment large, medially grooved.

Length, 7.8 millimeters; breadth, 2.5.

Holotype, male, loan deposit, California Academy of Sciences, Ta-hau, near Vo-lau, western Hainan, altitude 180 meters, June 17, 1935, taken by the author; allotype, female, in the Lingnan Natural History Museum, near Fooi-iu, northwest of Nodoa, August 20, 1929, Lingnan Univ. Fifth Hainan Exped.

Differs from *Ropica formosana* Bates in having the prothorax longer and less swollen, the elytral bases more raised and rugose, and in other respects.

Distribution.—Hainan Island.

ROPICA NGAUCHILÆ Gressitt sp. nov. Plate 7, fig. 8.

Male.—Small, subcylindrical, hardly broadened posteriorly. Body dull reddish brown; head, sides, and middle of pronotal disc, median portions of elytral discs, and thoracic sterna blackish; antennæ, abdomen, and legs lighter reddish brown; surfaces irregularly clothed with whitish to dull-gray pubescence: head unevenly pale tawny-gray; antennæ faintly ringed with grayish white, and with many erect hairs on distal half; prothorax thinly tawny-gray, more densely tawny on each side of median dark stripe; scutellum tawny at each side; elytra grayish tawny on outer half of each, irregular on inner half, more densely tawny

basally, subglabrous beyond middle, and with longitudinal spots of pale gray posteriorly; ventral surfaces pale tawny-gray on thoracic sterna and buffy white on abdomen and legs.

Head finely punctured; inferior eye lobes small, about as broad as deep. Antennæ slender, one and one-third as long as body; scape shorter than third segment, feebly punctured; fourth segment about as long as third, slightly longer than fifth segment, prothorax broader than long, evenly convex laterally; disc finely and closely punctured, moderately convex in center. Elytra narrowly rounded posteriorly, each closely subseriate-punctate on inner half, with two feebly raised, incomplete costæ.

Female.—Antennæ slightly longer than body; fourth abdominal segment distinctly shorter than second.

Length, 5.6 to 6.4 millimeters; breadth, 2.

Holotype, male, No. 53625 United States National Museum, Tachian, foot of Five Finger Mountains, southcentral Hainan, altitude 600 meters, June 13, 1935; allotype, female, in the author's collection, June 17, 1935; paratype, male, in the Lingnan Natural History Museum, June 14, 1935, all collected by the author.

Differs from *R. formosana dorsalis* Schwarzer in being more elongate, with the antennæ slenderer and less distinctly annulated, the elytra carinate and with various short stripes and no transverse preapical white bars and other differences. The name refers to the Hainanese term for the Five Finger Mountains, Ngau-chi-lia.

Distribution.—Hainan.

ROPICA FORMOSANA DORSALIS Schwarzer.

Ropica formosana var. *dorsalis* SCHWARZER, Ent. Blätter 21 (1925) 145, Formosa; GRESSITT, Lingnan Sci. Journ. 18 (1939) 78.

Female.—Light reddish brown; blackish brown on front of head, on neck, sides of prothorax, humeri, and central portions of elytral discs; dark reddish brown on sides of thoracic sterna and on femora; surfaces irregularly clothed with whitish to tawny-gray pubescence: head thinly whitish gray, pale tawny on antennal supports; antennæ spotted and narrowly ringed at apices of segments with grayish white; prothorax pale gray at sides, largely pale tawny on disc; elytra thinly tawny-gray, not hiding derm, an arcuate whitish mark on each behind middle, a few scattered whitish dots, and a minute white hair in each puncture.

Head finely and closely punctured. Antennæ not very slender, slightly longer than body; scape barely as long as third segment. Prothorax distinctly transverse, feebly convex laterally, its surface finely punctured, an incomplete stripe on middle of disc. Elytra broadest behind middle, subrounded apically, surfaces closely punctured.

Length, 6 millimeters; breadth, 2.6.

A single female, in the author's collection, taken by the author at Ta-hau, near Vo-lau, western Hainan, altitude 180 meters, July 4, 1935.

New to Hainan.

Distribution.—Hainan; Formosa; Kwangtung.

Genus *IPROCA* Gressitt novum

Depressed-cylindrical; narrow. Frons subrectangular, emarginate laterally and above; vertex obtusely concave; antennal supports moderately prominent; eyes coarsely faceted, completely divided into distant lobes, inferior lobe convex and lying in a depression; antennæ about as long as body, scape subcylindrical and barely longer than third segment, fourth segment fully as long as third; prothorax subcylindrical, feebly swollen before middle, about as broad as long; elytra elongate, subparallel, narrowed and separately acuminate apically, concave along middle of disc of each; anterior coxal cavities entire, angulate externally; middle coxal cavities open exteriorly; mesosternal intercoxal process plain, gradually declivitous anteriorly; middle tibiæ emarginate preapically; tarsi as long as tibiæ, with third segment of last pair distinctly shorter than first and less than one-half as long as last.

Genotype.—*Iproca acuminata* Gressitt sp. nov.

Range.—Hainan Island.

This genus differs from *Ropica* in having the frons smaller and less convex, the eyes more coarsely faceted, with the lobes more distant, the vertex more concave, the antennæ less tapered distally, the prothorax longer and more cylindrical, the elytra acuminate posteriorly, and the femora with a hairy depression beneath.

IPROCA ACUMINATA Gressitt sp. nov. Plate 5, fig. 8; Plate 7, fig. 6.

Male.—Dull reddish brown; head and thorax (except anterior margin) blackish; surfaces largely clothed with varied pubescence: head with gray-brown, duller on genæ and occiput, grayish white along lower margins of frons and genæ, and behind

antennal insertions; antennæ with gray-brown at base, as far as apex of third segment, with grayish buff on basal two-thirds of fourth segment, and just beyond bases of following three or four, remainder dark reddish brown; prothorax subglabrous and thinly clothed with tawny on notal disc, except for a fine, median, grayish-white line, sides dark sooty brown along middle, striped above and below with grayish white; elytra pale tawny-gray or grayish buff, each striped along median depression of disc, along basal third near suture with gray-brown, and along the two ridges bordering median depression with grayish white; ventral surfaces tawny-gray along middle, and grayish white on sides, of thoracic sternites, grayish white on abdomen mixed with tawny-gray on basal segments. Apical antennal segments with minute, scattered, suberect hairs.

Head subsquarish in front; frons grooved medially, deeply punctured; occiput deeply punctured, concave and medially grooved between superior eye lobes; inferior eye lobes overhung slightly by antennal supports, a little broader than deep, occupying slightly more than one-half space between antennal supports and genal margins. Antennæ barely longer than body; segments cylindrical and of equal thickness beyond scape; scape barely longer than third segment; fourth segment slightly longer than scape. Prothorax with anterior margin of notum convex and disc feebly swollen, closely and deeply punctured. Scutellum short, subrounded behind. Elytra deeply subseriate-punctate and strongly produced and acuminate apically, leaving a deep, rounded emargination between. Metasternum punctured at sides. First abdominal segment as long as following two combined. Posterior femora swollen, longer than tibiæ, reaching to end of fourth abdominal segment, a fringed depression on underside of each.

Length, 8.6 millimeters; breadth, 2.2.

Holotype, male, loan deposit, California Academy of Sciences, Ta-hian, near Five Finger Mountains, southcentral Hainan, altitude 600 meters, June 19, 1935, taken by the author.

Similar in appearance to *Ropica sublineata* Gressitt, but more attenuate, with the elytral apices acuminate, and other differences.

Distribution.—Hainan Island.

Genus EUNIDIA Erichson

Eunidia ERICHSON, Archiv. f. Naturg. 9 1 (1843) 261; THOMPSON, Syst. Cer. (1864) 396; LACORDAIRE, Gen. Col. 9 (1872) 580, 585.

Anomæsia PASCOE, Trans. Ent. Soc. London (2) 4 (1858) 255.

Frixus THOMSON, Archives Ent. 1 (1857) 313.

Syessita PASCOE, Journ. Ent. 2 (1864) 284.

Trittomiscus FAIRMAIRE, Revue d'Ent. 11 (1892) 125.

Body slender; head wider than prothorax; eyes finely faceted, emarginate, large, reaching nearly to genal angles; antennæ long, slender; scape slender; third segment barely one-third as long as either scape or fourth segment; prothorax small, sub-cylindrical, narrowest at base; elytra narrow, rounded apically; middle intercoxal process very narrow; legs slender; femora reaching to about middle of abdomen; tarsi barely three-fifths as long as tibiæ, last segment small.

Genotype.—*Eunidia nebulosa* Erichson.

Range.—Ethiopian and Oriental Regions.

EUNIDIA LATERALIS Gahan. Plate 5, fig. 2.

Eunidia lateralis GAHAN, Ann. & Mag. Nat. Hist. (6) 11 (1893) 387, southern India.

Male.—Black; elytra reddish brown; abdomen dark reddish brown with apical margins lighter; dorsal surfaces of head, prothorax, and elytra clothed with orange-yellow pubescence; sides, including lateral declivitous portions of elytra, thinly clothed with darker pubescence; ventral surfaces, legs, and antennæ sparsely clothed with palish hairs.

Head feebly concave between antennal insertions, minutely punctured; inferior eye lobes large, subreniform, nearly twice as deep as wide. Antennæ nearly twice as long as body; scape long, gradually thickened apically; third segment very short, angulate ectoapically; following segments long, subequal. Prothorax cylindrical, finely punctulate, plane on disc. Elytra finely and irregularly punctulate.

Length, 6 millimeters; breadth, 1.65.

Female.—Antennæ one and one-half as long as body.

Length, 7 millimeters; breadth, 2.

One female, in the Lingnan Natural History Museum, was taken on Hainan in 1932 by Prof. W. E. Hoffmann; 1 male, in the author's collection, was collected at Ngai-chau, Yai District, southern Hainan, May 27 to 30, 1932, by W. E. Hoffmann and O. K. Lau.

New to Hainan.

Distribution.—India; Hainan.

PTERICOPTINI

PTERICOPTIDE Lacordaire, Gen. Col. 9 (1872) 601.

PTERICOPTINI Aurivillius, Col. Cat. 73 (1922) 294.

Frons subrectangular; vertex more or less concave; eyes deeply emarginate; antennæ about as long as body; scape swollen, shorter than third segment; prothorax subcylindrical, elytra parallel, generally but little wider than prothorax; anterior and middle intercoxal process feebly raised; anterior coxal cavities closed; middle coxal cavities nearly closed to epimera externally; middle tibiæ emarginate preapically; tarsal claws divergent.

Key to the Hainan genera of Ptericoptini.

Vertex feebly concave; antennal supports low; prothorax broader than long; elytra lacking distinctly raised costæ..... *Sybra*.
 Vertex distinctly concave; antennal supports raised; prothorax longer than broad; elytra subcostate *Atimura*.

Genus SYBRA Pascoe

Sybra PASCOE, Trans. Ent. Soc. London (3) 3 (1865) 141, 198; LACORDAIRE, Gen. Col. 9 (1872) 603, 615.

Dorsoventrally compressed; frons rectangular; vertex feebly concave; antennal supports distant, hardly raised; eyes subcoarsely faceted, deeply emarginate; antennæ about as long as, or a little longer than, body; scape short, subfusiform; prothorax generally broader than long, feebly swollen laterally or constricted apically; elytra long, subdentate or obliquely truncate apically; legs short, with posterior femora reaching but slightly beyond middle of abdomen.

Genotype.—*Ropica stigmatica* Pascoe.

Range.—Oriental Region; Indo-Australian and Melanesian Subregions.

Key to the Hainan species of Sybra.

1. Prothorax distinctly broader than long, nearly as broad as elytral bases; head and prothorax together less than one-half as long as elytra..... 2.
 Prothorax about as long as broad, less than three-fourths as wide as elytral bases; head and prothorax together about one-half as long as elytra 3.
2. Frons wider than high; scape two-thirds as long as third antennal segment; elytra regularly striate-punctate, separately acute apically; over 7.5 millimeters long *punctatostriata*.
- Frons higher than wide, emarginate laterally; scape about as long as third segment; elytra irregularly punctured on basal portion near suture, separately obtuse apically; less than 5 millimeters long.

breuningii.

3. Prothorax slightly broader than long, with punctures moderately dense; elytra brown, lighter apically clothed with tawny-buff..... *posticalis*.
 Prothorax slightly longer than broad, with punctures closely reticulate above; elytra black at sides and at base near scutellum, dull reddish with gray pubescence on remainder..... *pascoei*.

SYBRA BREUNINGI Gressitt sp. nov.

Dark brown, reddish on labrum, clypeus, bases of antennal segments, anterior and posterior margins of pronotum, postbasal, sutural, and apical portions of elytra, tarsi, tibiae in large part, extremities of femora, and apex of abdomen; front of head and ventral sternites nearly black; surfaces largely clothed with tawny-gray above and whitish gray beneath: head with pale gray, slightly tawny behind eyes; antennae thinly clothed, distinctly grayish white at bases of last six segments; prothorax pale gray at sides, tawny-gray above; elytra pale tawny-gray, with irregular blotches of grayish-white pubescence and subglabrous areas on discs; ventral surfaces pale gray on middle of thoracic sternites and on abdomen, tawny-gray on sides of thorax.

Head finely and sparsely punctured; frons emarginate laterally, broadest at top; inferior eye lobes large, obliquely oval, closely approaching genal margins. Antennae one and one-sixth as long as body, slender; scape feebly swollen, about as long as third segment; fourth segment longer than third. Prothorax distinctly broader than long, swollen at middle, finely, though deeply and somewhat closely, punctured. Elytra narrowed in apical two-fifths; apices obtusely angulate; surfaces closely seriate-punctate, irregularly punctured along suture at base. Metasternum deeply punctured at sides.

Length, 3.55 millimeters; breadth, 0.95.

Holotype, male(?), loan deposit, California Academy of Sciences, Ta-hau, near Vo-lau, western Hainan, altitude 175 meters, July 6, 1935, taken by the author.

Differs from most species of *Sybra* in having the frons narrowed, the inferior eye lobes large, the third antennal segment no longer than the scape, the elytra with more rows of punctures and simply obtuse apically, and in other respects.

Distribution.—Hainan Island.

SYBRA PASCOEI Lameere. Plate 5, fig. 11.

Sybra Pascoei LAMEERE, Mem. Soc. ent. France 62 (1893) 285, Annam.

Black, reddish brown on first three antennal segments and bases of remaining antennal segments, sides of prothorax, parts

of ventral surfaces and legs, and on each elytron as follows: a broad, oblique stripe from humerus to suture, extending along latter to apex, with outer border somewhat irregular; surfaces clothed with thin brownish-gray pubescence, sides of prothorax and lighter portions of elytra with tawny-buff pubescence.

Head deeply and irregularly punctured. Antennæ slender, about as long as body; scape short and thick, barely two-thirds as long as third segment. Prothorax densely and deeply reticulate-punctate on disc, closely and more finely punctured laterally. Elytra entirely seriate-punctate; apices separately produced, subacute.

Length, 5.4 millimeters; breadth, 1.35.

A single male, in the author's collection, was taken by the writer at Ta-han, near Red Mist Mountain, central Hainan, altitude 750 meters, June 7, 1935.

New to Hainan.

Distribution.—Indo-China; Annam; Hainan.

SYBRA POSTICALIS (Pascoe).

Ropica posticalis PASCOE, Trans. Soc. Lond. (2) 4 (1858) 248, Hongkong.

Sybra posticata, GAHAN, Ann. & Mag. Nat. Hist. (7) 5 (1900) 352, Hainan. (nec. Gahan, 1894).

Sybra posticalis AURIVILLIUS, Col. Cat. 73 (1923) 301; GRESSITT, Ling. Sci. Journ. 18 (1939) 80, Lan-tau Island, near Hongkong.

Female.—Dark brown, somewhat reddish on bases of antennal segments, humeri and parts of sides of elytra, parts of legs, and bases of abdominal segments; surfaces thinly clothed with light brown or grayish, in part with denser tawny or whitish pubescence: head with tawny-brown, mixed with some grayish; antennæ thinly clothed with pale, more densely so on bases of last six segments; prothorax gray-brown at sides; notum with a median stripe and some irregular lateral markings, of tawny; elytra thinly clothed with pale rusty brown, spotted or mixed with grayish, bases striped with tawny, apical halves tawny along inner portions, a blackish spot on middle of each at beginning of apical fifth; ventral surfaces with dense tawny on sides of metasternum and along abdominal segments as incomplete stripes.

Head deeply and sparsely punctured. Antennæ five-sixths as long as body; scape swollen, three-fourths as long as third segment. Prothorax somewhat heavily punctured above, more sparsely so at sides. Elytra seriatly punctured except for dense-

ly and irregularly punctured areas along suture near base; apices obliquely truncate and obtusely produced.

Length, 5.6 to 7.4 millimeters; breadth, 1.7 to 2.3.

Three female specimens, in the Lingnan Natural History Museum and the author's collection, collected by the author; 1 at Ta-han, central Hainan, altitude 750 meters, June 7, 1 at Nodoa, altitude 250 meters, June 28, 1 at Ta-hau, altitude 175 meters, July 4, 1935.

Distribution.—Hongkong; Hainan Island.

SYBRA PUNCTATOSTRIATA Bates.

Sybra punctatostriata BATES, Proc. Zool. Soc. London (1866) 351, Formosa; GRESSITT, Lingnan Sci. Journ. 16 (1937) 610, southern Kiangsi.

Female.—Dull reddish brown, blackish brown on apices of antennal segments, on base and along middle of disc of each elytron, and on thoracic sterna and bases of abdominal segments; surfaces irregularly clothed with grayish brown, tawny, or whitish pubescence: head grayish brown, with two tawny stripes on occiput and one tawny stripe on each gena; antennæ thinly clothed with grayish brown; prothorax grayish brown, with five tawny stripes on notum and one tawny stripe on each side below middle; elytra in the main alternately striped along punctural interstices with tawny and grayish brown, in part with dark brown interrupted by whitish marks; ventral surfaces pale buffy gray, tawny on sides of metasternum; legs grayish brown, mixed with tawny.

Head finely and irregularly punctured. Antennæ barely longer than body; scape swollen, two-thirds as long as third segment. Prothorax not very closely or deeply punctured; elytra regularly striate-punctate, an extrasutural row at base; apices separately produced, subacute.

Length, 6.75 to 9.5 millimeters; breadth, 1.8 to 2.7.

Four females, in the Lingnan Natural History Museum and the author's collection, 1 at Lam-ko, Lin-kaio District, May 23 to 25, 1932, 1 at Sam-ah-kong, Yai District, January 24 to 26, 1935, F. K. To; 1 at Ta-hian, near foot of Five Finger Mountains, June 11, 1935, taken by the author; 1 at Fan-heang, southcentral Hainan, March 26, 1936, taken for the author by a native collector.

New to Hainan.

Distribution.—Formosa; Hainan; Kiangsi.

Genus ATIMURA Pascoe

Atimura PASCOE, Trans. Ent. Soc. London (3) 1 (1863) 548; LACORDAIRE, Gen. Col. 9 (1872) 613.

Narrow and cylindrical; frons subrectangular; antennal supports distant, prominent; eyes deeply emarginate, subcoarsely faceted; antennæ slender, about as long as body, scape thick and much shorter than third segment; prothorax cylindrical, longer than broad; elytra parallel-sided, abruptly narrowed posteriorly, subrounded or angulate at apices, surfaces more or less costate; tarsi slender, fully as long as tibiæ.

Genotype.—*Atimura terminata* Pascoe.

Range.—Australia; Oriental Region.

Key to the Hainan species of *Atimura*.

- Pronotum closely and finely reticulate-punctate; elytra with four distinctly raised, but partly broken, longitudinal costæ and a few tubercles on apical declivities; apices subacute..... *apicalis*.
 Pronotum irregularly and somewhat coarsely punctured, subnodose at center; elytra with some indistinct costæ, without tubercles on apical declivity; apices obtusely rounded..... *cylindrica*.

ATIMURA APICALIS Gahan.

Atimura apicalis GAHAN, Ann. Mus. Civ. Genova 34 (1895) 76, Burma.

Female.—Dark reddish brown, blackish on antennæ, pronotum, elytral costæ, sides of metasternum, abdomen except at base and apex, femora, and tibiæ; surfaces with tawny-buff, grayish, and brownish pubescence: head quite densely clothed with tawny-buff, some subglabrous areas on frons; antennæ thinly clothed with gray-brown, paler at extreme base of each segment; prothorax thinly clothed with pale gray, streaked with tawny on lower parts of sides and briefly at middle and each side of pronotum at apex and base; elytra thinly clothed with brownish gray, except on posterior declivity, which is covered with dense, pale buff; ventral surfaces tawny along middle of thoracic sterna, whitish gray on sides of metasternum, grayish on basal four abdominal segments and tawny on last segment.

Head deeply and somewhat closely punctured. Antennæ not quite as long as body. Prothorax a little longer than broad, somewhat closely punctured. Elytra each with four distinctly raised, though in part interrupted, costæ, apical declivity abrupt, bearing about five tubercles, and apical margin subacutely produced; surfaces in part seriate-punctate.

Length, 7 to 8 millimeters; breadth, 1.6 to 1.8.

Three females were collected: 1, in the Lingnan Natural History Museum, at Sam-ts'uen-kai-hui, near Lai-mo-ling, June 27 to 30, 1935, F. K. To; 1 in the author's collection, at Ta-hau, near Vo-lau, western Hainan, July 5, 1935, taken by the author; 1 in the Musée Heude, at Sam-a (Sam-ah-kong), southern Hainan, May 9, 1936, G. Ros.

New to Hainan.

Distribution.—Burma; Hainan.

ATIMURA CYLINDRICA Gressitt sp. nov. Plate 5, fig. 6.

Female.—Cylindrical; evenly declivitous posteriorly. Body dark brown, somewhat reddish on antennæ, pronotal disc anterior to center, elytra along sides behind humeri and on part of apical portions, bases of abdominal segments, bases and apices of femora and tibiæ, and tarsi in large part; surfaces irregularly clothed with tawny to pale-gray pubescence: head clothed with dense, tawny pubescence, thinner behind eyes; antennæ thinly clothed with gray-brown, denser and whitish gray at bases of last six segments; prothorax thinly clothed with tawny and grayish, three barely distinct, longitudinal, tawny stripes on disc; elytra sparsely clothed with grayish and with a few seriatly arranged, narrow, tawny spots on basal three-fifths, remainder clothed with tawny and marked with irregular dark-brown subglabrous spots; ventral surfaces thinly clothed with grayish buff, tawny along middle of sternites and on pleura of thoracic segments, and tawny-buff on sides of last abdominal sternite.

Head deeply and rather closely punctured; inferior eye lobes deeper than wide; occiput grooved medially. Antennæ about as long as body; scape thick, three-fifths as long as third segment; fourth segment a little shorter than third, one and one-third as long as fifth. Prothorax longer than broad, feebly swollen at middle of each side, closely and deeply punctured. Elytra parallel-sided, obtusely rounded posteriorly; surface of each closely subseriate-punctate, with some indistinctly raised longitudinal costæ on disc, outermost costa raised near apex; apices evenly declivitous, lacking tubercles. Thoracic sterna deeply and closely punctured laterally.

Length, 7.6 to 8.2 millimeters; breadth, 1.9 to 2.

Holotype, female, No. 53626 United States National Museum, Tahau, near Vo-lau, western Hainan, altitude 175 meters, July 4, 1935, taken by the author; one female paratopotype, in the author's collection, same data.

Differs from *A. combreti* Gardner in having the shoulders and suture dark, the prothorax a little longer than broad, and the elytral costæ feeble and unbroken.

Distribution.—Hainan Island.

APODASYINI

APODASYIDES Lacordaire, Gen. Col. 9 (1872) 416, 623.

APODASYINI Aurivillius, Col. Cat. 73 (1922) 305; MATSUSHITA, Journ.

Fac. Agr. Hokkaido Imp. Univ. 34 (1933) 316, 374.

Scape simple; tarsal claws divaricate; middle tibiæ lacking an external groove; anterior coxal cavities closed behind, briefly angulate externally; middle coxal cavities open externally to epimera; anterior coxæ globular; frons rectangular; metepisterna narrow; antennæ relatively short, hairy; eyes finely to somewhat coarsely faceted; elytra conjointly rounded apically; legs short, first hind tarsal segment shorter than following two segments combined.

Key to the Hainan genera of Apodasyini.

Scape subequal to third and following segments; first abdominal segment longer than following two segments combined; elytra fully one-half as broad as long; prothorax closely and finely punctured..... *Terinxæ*.
Third antennal segment longer than scape, subequal to fourth segment, distinctly longer than fifth; first abdominal segment shorter than following two segments combined; elytra less than one-half as broad as long; prothorax irregular punctured..... *Pseudanæsthetis*.

Genus TERINÆA Bates

Terinxæ BATES, Journ. Linn. Soc. Zool. 18 (1884) 249; MATSUSHITA, Journ. Fac. Agr. Hokkaido Imp. Univ. 34 (1933) 374.

Head as broad as prothorax, transversely subrectangular and convex in front; eyes emarginate and subfinely faceted, deeper than wide below; antennæ slightly longer than body, filiform, scape subcylindrical and subequal in length to third and following segments; prothorax short, slightly expanded laterally, armed behind middle of each side with a short, sharp spine; scutellum rounded; elytra broad, conjointly rounded apically; first abdominal segment as long as following two segments combined; femora swollen, hind pair reaching fourth abdominal segment; tarsi short, first segment shorter than following two segments combined.

Genotype.—*Terinxæ atrofusca* Bates.

Range.—Japan proper; Hainan Island.

TERINÆA RUFONIGRA Gressitt sp. nov. Plate 5, fig. 15.

Male.—Black; prothorax, mesothorax, including scutellum, trochanters, and anterior coxæ partially, reddish chestnut. Body largely clothed with thin, gray pubescence on dark portions, and with short, oblique bristles, particularly on elytra; antennæ with a fringe of sparse oblique bristles internally.

Head moderately convex in front, finely punctulate; frons broader than high, wider above than below; vertex finely grooved, nearly horizontal between antennal insertions; eyes with inferior lobes one and one-third as high as wide, reaching three-fourths distance from antennal insertions to bases of mandibles. Antennæ slightly longer than body; scape subequal in length to third and following segments, respectively. Prothorax broader than long, a little broader at apex than at base, slightly constricted above near each extremity, finely and acutely spined a little behind middle of each side, finely and closely punctured. Elytra about one-half as broad as long, conjointly rounded apically, densely and irregularly punctured throughout. Ventral surface distinctly punctured on sides of metasternum and first abdominal segment. Femora subfusiform; tarsi slender.

Female.—Antennæ a little longer than body; hind femora hardly reaching fourth abdominal segment; last abdominal segment as long as three preceding segments combined, medially grooved.

Length, 4.1 to 4.5 millimeters; breadth, 1.4.

Holotype, male, No. 53448 United States National Museum, Ta-han, near Red Mist Mountain, central Hainan, altitude 750 meters, June 24, 1935, and allotype, female, in the author's collection, June 21, both taken by the author.

Differs from *T. atrofusca* Bates of Japan in being smaller, black with a red thorax, instead of dark brown, the prothorax more convex above, the elytra more distinctly punctured, and the antennæ with longer and sparser internal hairs.

Distribution.—Hainan Island.

Genus PSEUDANÆSTHETIS Pic

Pseudanæsthetis Pic, Mel. Exot. Ent. 37 (1922) 15.

Head not broader than prothorax at middle, nearly horizontal between antennal insertions, hardly convex in front; eyes not very finely faceted, inferior lobes nearly as broad as deep; antennæ generally shorter than body; scape subcylindrical, shorter than third segment; fourth segment a little shorter than third,

distinctly longer than fifth; prothorax about as long as broad, slightly broader at base than at apex, constricted near base, swollen and foveate-punctate in middle with a small tubercle behind middle of each side; elytra parallel, conjointly rounded apically, subseriately punctured; femora short, swollen; tarsi nearly as long as tibiae.

Genotype.—*Pseudanæsthetis langana* Pic.

Range.—South China; Indo-China; Hainan; Formosa.

Key to the Hainan species of Pseudanæsthetis.

- Third antennal segment one and one-third as long as scape, prothorax foveate-punctate, finely toothed at sides; head and prothorax testaceous, elytra, legs, and antennæ dark brown..... *seticornis*.
 Third antennal segment one and two-thirds as long as scape; prothorax finely punctate, tuberculate at sides; body reddish brown, legs and antennæ black *whiteheadi*.

PSEUDANÆSTHETIS SETICORNIS Gressitt sp. nov. Plate 5, fig. 14.

Female.—Brownish red, tinged with black at elytral apices and posterior borders of abdominal segments; antennæ, eyes, and legs black. Body clothed with very sparse pale pubescence and moderately long, fine, erect bristles.

Head as broad as prothorax at middle, feebly convex, sparsely and distinctly punctured; frons a little wider than deep; vertex nearly plane between antennal insertions; eyes deeply emarginate, subfinely faceted, inferior lobes slightly deeper than wide.

Antennæ slender, not quite as long as body; scape subcylindrical, four-fifths as long as third segment, practically as long as fourth segment; fifth segment three-fifths as long as fourth. Prothorax barely longer than breadth at middle, narrower at apex than at base, slightly broader behind middle, a minute spine at each side on subconstricted basal and apical portions. Elytra subparallel, conjointly rounded apically; surfaces of each deeply and quite closely punctured in about thirteen subregular rows. Ventral surfaces not distinctly punctured. Legs short; femora swollen; tarsi four-fifths as long as tibiae.

Length, 4.6 millimeters; breadth, 1.5.

Holotype, female, in the California Academy of Sciences, Tiahian, Five Finger Mountains, Hainan, altitude 650 meters, June 15, 1935, taken by the author.

Differs from *P. langana* Pic in having the antennæ much slenderer, the prothorax with longer punctures and slenderer lateral tubercles, the elytra more deeply punctured, and the bristles longer and sparser.

Distribution.—Hainan Island.

PSEUDANÆSTHETIS WHITEHEADI Gressitt sp. nov.

Male.—Dark chocolate-brown; head, prothorax, and scutellum orange-testaceous. Body sparsely clothed with pale pubescence and short, fine, oblique hairs; antennæ internally with a row of moderately long bristles.

Head broader than base of prothorax, moderately convex, distinctly punctured; frons wider than deep, emarginate on all sides; vertex shallowly concave between antennal insertions; eyes deeply emarginate, inferior lobes a little deeper than wide, reaching three-fifths distance from antennal insertions to bases of mandibles. Antennæ nearly one and one-half as long as body, moderately slender; scape three-fifths as long as third segment; fourth segment subequal to third, nearly twice as long as fifth; fifth and sixth segments subequal. Prothorax a little broader than long, as broad at apex as at base, constricted near base and slightly so between middle and apex, armed with a short, blunt tubercle just behind middle of each side; surface deeply and rather regularly punctured. Scutellum short and rounded. Elytra broadened from base to beyond middle, rounded apically; surfaces punctured in about fifteen somewhat irregular rows. Legs slender; first hind tarsal segment nearly as long as following two united.

Length, 6.6 millimeters; breadth, 2.2.

Holotype, male, British Museum, 99.315, Hainan Island, 1899, J. Whitehead.

This species is only provisionally referred to this genus, differing from *P. langana* Pic and the preceding species in having the antennæ longer than the body, the third segment nearly twice as long as the scape; the prothorax no longer than broad, as broad at apex as at middle; not transversely sulcate or carinate near extremities; the femora less swollen; and in other characters.

Distribution.—Hainan Island.

ESTOLINI

ESTOLIDES Lacordaire, Gen. Col. 9 (1872) 416, 636.

ESTOLINI Aurivillius, Col. Cat. 73 (1922) 317.

Frons subrectangular, generally transverse; antennal insertions distant; vertex more or less concave; eyes coarsely faceted, emarginate; antennæ slender, generally not longer than body; scape somewhat thickened, usually shorter than third segment; anterior coxal cavities angulate externally; middle coxal

cavities nearly closed to epimera externally, process between them nearly at level of coxæ; middle tibiæ grooved externally; tarsal claws divaricate.

Key to the Hainan genera of Estolini.

1. Antennal scape swollen, only about one-half as long as third segment; vertex distinctly concave; prothorax cylindrical, longer than broad..2.
Antennal scape subcylindrical, as long as third segment; vertex horizontal; prothorax cylindrical; elytra briefly acuminate apically.

Microestola.

2. Antennal supports distant; vertex shallowly concave; antennæ hardly longer than body; prothorax slightly longer than broad..... *Donysia.*
Antennal supports subapproximate; vertex deeply concave; antennæ about twice as long as body; prothorax nearly twice as long as broad.

Zotale.

Genus ZOTALE Pascoe

Zotale PASCOE, Trans. Ent. Soc. London (3) 3 (1866) 329; LACORDAIRE, Gen. Col. 9 (1872) 647.

Head narrower than prothorax; antennal supports prominent; eyes small, subcoarsely faceted, nearly divided; antennæ longer than body, slender; scape subfusiform, two-thirds as long as third segment; prothorax nearly cylindrical, barely longer than broad, somewhat raised anteriorly; scutellum short, rounded-truncate posteriorly; elytra slightly and evenly narrowed posteriorly, subtruncate apically; femora slender; middle tibiæ emarginate externally before apices.

Genotype.—*Zotale unicolor* Pascoe.

Range.—Sumatra; Burma; Tenasserim; Tonkin; Hainan; southern China.

ZOTALE LINEATA (Gahan).

Mycerinopsis lineatus GAHAN, Ann. Mus. Civ. Genova 34 (1894) 75.

Zotale lineata GAHAN, Ann. & Mag. Nat. Hist. (7) 5 (1900) 352, Hainan.

Female.—Dark reddish brown, lighter on antennæ, elytra, parts of lateral portions of thoracic and abdominal sternites, and parts of legs, nearly black along middle of thoracic and abdominal sternites. Head, prothorax, elytra, and sides of thoracic sterna clothed with tawny pubescence, with longitudinal stripes of denser pubescence: two on vertex, three on pronotum, and three or four narrower stripes on each elytron; ventral surfaces and legs thinly clothed with silky grayish-buff pubescence; antennæ thinly clothed with buffy gray and with a ventral fringe of fine, erect hairs from second segment to apex.

Head coarsely punctured; inferior eye lobes rounded-triangular; antennæ one and one-third as long as body, slender; scape short, subfusiform, deeply punctured, two-thirds as long as third segment; prothorax subcylindrical, raised anteriorly, barely longer than broad, deeply, but not very closely, punctured; elytra obliquely truncate apically; surface of each deeply punctured, subseriately along middle of disc on basal half, distinctly so posteriorly, particularly along sutural half.

Length, 15.4 millimeters; breadth, 3.6.

One specimen, in the Lingnan Natural History Museum, taken at Chung-mei, 15 miles southeast of Nam-fung, Lin-kao District, August 18 and 19, 1932, by F. K. To.

Distribution.—Burma; Tenasserim; Hainan; South China.

Genus DONYSIA Gressitt novum

Head deeper than wide; occiput strongly oblique to frons; antennal supports distinctly raised; frons wider than high, emarginate laterally; inferior eye lobes about as wide as deep, occupying about one-half space between antennal supports and genal margins; antennæ slender, longer or shorter than body; scape swollen, much shorter than third segment; prothorax cylindrical, rough on disc; elytra long and narrow, subangulate apically.

Genotype.—*Sydonia costata* Matsushita.

Range.—Japan; Ryu Kyu Islands; South China; Hainan.

This genus differs from *Sydonia* Thomson in having the scape short and swollen instead of moderately long and cylindrical, the vertex broad and shallowly concave, and in other respects. Differs from *Zotale* Pascoe in having the antennal supports much more distantly separated, the vertex less concave, and the antennæ shorter. This new genus contains *Sydonia subglabrata* and *S. ropicoides* Gressitt, as well as the type.

DONYSIA COSTATA (Matsushita) comb. nov.

Sydonia costata MATSUSHITA, Journ. Fac. Agr. Hokkaido Imp. Univ. 34 (1933) 379, pl. 5, fig. 1, Okinawa, Ryu Kyu Islands.

Male.—Narrow; subcylindrical; declivitous anteriorly and posteriorly. Body blackish brown, tinged with reddish brown on most of sutural half of each elytron and on abdomen; surfaces clothed with tawny pubescence of varying density: head sparsely clothed; antennæ with very thin and sparse pubescence, underside of third segment with a fringe of sparse, oblique, pale hairs; prothorax subglabrous above, more densely clothed at sides; elytra very thinly clothed with tawny-gray on bases and sides,

nearly to suture at middle, remainder with denser tawny-buff pubescence; ventral surfaces densely clothed on thoracic sterna, and sparsely on abdomen and legs.

Head heavily punctured; inferior eye lobes occupying about two-thirds space between antennal insertions and genal angles. Antennæ barely as long as body; scape thick, one-half as long as third segment; fourth segment nearly as long as third, distinctly longer than fifth. Prothorax longer than broad, parallel-sided; disc with five distinct longitudinal ridges with coarse punctures between; some lesser ridges and punctures at sides. Elytra narrowed and obliquely truncated apically; surfaces deeply seriate-punctate on basal two-thirds, with some more or less completely raised costæ, innermost costa giving rise to a few low tubercles near base.

Length, 9 to 10 millimeters; breadth, 3 to 3.2.

Two specimens, in the Lingnan Natural History Museum and the author's collection, were taken at Nodoa, Tan District, Hainan, April 26 to 30, 1932, by F. K. To.

New to Hainan.

Distribution.—Ryu Kyu Islands; Hainan Island.

Genus MICROESTOLA Gressitt novum

Frons rectangular, transverse; antennal insertions distant and low; eyes deeply emarginate; antennæ about as long as body; scape slender; prothorax cylindrical, longer than broad; elytra narrow, separately angulate apically; anterior coxal cavities closed behind, briefly angulate externally; metepisternum narrow; abdominal segments subequal in length; posterior femora hardly reaching to apex of second sternite.

Genotype.—*Microestola bidentata* Gressitt sp. nov.

Range.—Hainan; Formosa.

This new genus differs from *Zotale* Pascoe in having the frons more transverse, the vertex less concave, the eyes larger, the antennæ shorter, the scape more cylindrical, the legs shorter, and in other respects; and from *Donysia* Gressitt in having the vertex less concave, the antennæ less slender, the scape longer, the third segment shorter, the prothorax more cylindrical, and in other characters.

MICROESTOLA BIDENTATA Gressitt sp. nov.

Male.—Body dark reddish castaneous, slightly blackish brown on parts of pronotum and elytra; ventral surfaces brownish black, reddish brown along median line of sternites; legs and antennæ reddish brown, slightly duller on scape. Surface in

part clothed with grayish-white or grayish-buff pubescence as follows: head and antennæ thinly clothed with slight tawny-buff; prothorax with sides and an indistinct median stripe on disc, with grayish buff; elytra with several irregularly spaced and partly broken, narrow-longitudinal stripes of grayish buff, remainder with thinner, dark-brown hairs; ventral surfaces with thin, whitish-buff pubescence, in part with a silvery sheen; legs sparsely clothed with pale.

Head coarsely punctured; vertex broad, shallowly concave; inferior eye lobes large, about as wide as deep. Antennæ about as long as body; scape moderately slender, as long as third segment. Prothorax cylindrical, about one and one-third as long as broad, closely punctured. Elytra parallel-sided, coarsely and irregularly punctured; apices separately acute. Ventral surfaces closely punctured, quite deeply so on sides of thoracic sternites.

Female.—Broader, with elytral apices more gradually narrowed, but less acuminate; antennæ four-fifths as long as body; sutural portion and extreme apices of elytra blackish; pubescence of elytra less distinctly striped, and with larger nonpubescent areas.

Length, 6.6 millimeters; breadth, 1.5.

Holotype, male, in the Lingnan Natural History Museum, Taiping-ts'uen (Dwa-Bi), near Loi Mother Mountain, central Hainan, altitude 375 meters, April 20 to 24, 1935, F. K. To; allotype, female, in the author's collection, Ta-hau, near Vo-lau, western Hainan, altitude 175 meters, July 4, 1935, taken by the author.

Distribution.—Hainan Island.

ACANTHOCININI

ACANTHOCINITÆ Thomson, *Classif. Cer.* (1860) 6; *Syst. Cer.* (1864) 23, 338.

ACANTHOCININÆ and EXOCENTRINÆ Pascoe, *Trans. Ent. Soc. London* (3) 3 (1865) 9, 26.

ACANTHOCINIDES Lacordaire, *Gen. Col.* 9 (1872) 757.

ACANTHOCININI Aurivillius, *Col. Cat.* 74 (1923) 390.

Frons rectangular; vertex weakly concave between the moderately distant antennal supports; antennæ generally very long in male, scape slender, cylindrical or cone-shaped, frequently as long as third segment; anterior coxal cavities rounded; middle coxal cavities closed externally to epimera; middle tibiæ emarginate externally before apices; femora clavate; tarsal claws divaricate.

Key to the Hainan genera of Acanthocinini.

1. Hind tarsi long, first segment longer than following two united..... 2.
Hind tarsi short, first segment shorter than following two united..... 4.
2. Body slender; prothorax fully as long as broad, scape not reaching as far as middle of prothorax, discs of pronotum and elytra not strongly tuberculate 3.
Body broad, prothorax transverse, strongly toothed above and at sides; elytra each strongly bidentate basally, antennal scape reaching beyond middle of prothorax *Neacanista*.
3. Prothorax broadly toothed laterally, antennæ densely clothed with long hairs internally; first hind tarsal segment shorter than remaining segments united *Ostedes*.
Prothorax rounded laterally, antennæ sparsely clothed with short bristles internally; first hind tarsal segment as long as remaining segments united *Rondibilis*.
4. Prothorax strongly transverse, produced at sides with a posteriorly-directed spine; body clothed with long bristles..... *Exocentrus*.
Prothorax subcylindrical, with a very fine, short spine at each side; body lacking long, erect bristles; antennæ briefly ciliate..... *Mizenia*.

Genus NEACANISTA Gressitt novum

Head somewhat deeply concave between antennal insertions, squarish in front; antennæ nearly twice as long as body; scape slender, gradually thickened, extending to beyond middle of prothorax; prothorax transverse, strongly tuberculate at each side, bituberculate on disc; elytra broad basally, narrowed, transversely truncated and externally toothed at apices, bituberculate basally; anterior coxal cavities closed posteriorly, briefly angulate externally; middle coxal cavities closed externally to epimera, process separating them broad and truncate; metepisterna narrow, parallel-sided; femora pedunculate and suddenly clavate; tarsi slender, first segment of hind pair nearly as long as following united; claws divaricate.

Genotype.—*Neacanista tuberculipenne* Gressitt sp. nov.

Range.—Hainan Island.

This new genus differs from *Acanista*²⁰ Pascoe in having the antennæ short, the scape barely reaching base of elytra, gradually thickened apically, instead of being clavate, the prothorax bituberculate above, the elytra each bituberculate basally and less strongly spined apically.

NEACANISTA TUBERULIPENNE Gressitt sp. nov. Plate 7, fig. 7.

Blackish brown varied with reddish brown; irregularly clothed with brown, buff, tawny, and whitish pubescence: head blackish

²⁰ Trans. Ent. Soc. London (3) 3 (1865) 10 (type: *A. alphoides* Pasc.).

brown with brown, mixed with tawny-gray, pubescence; antennæ dark brown, basal portions of segments clothed with tawny-white pubescence; prothorax blackish, clothed with tawny, mixed with whitish pubescence; elytra dark reddish brown, clothed with pubescence that is largely tawny-brown basally and whitish preapically, spotted and mixed with dark brown, tawny, and buff, tubercles nearly black; ventral surfaces evenly clothed with tawny-gray; legs reddish brown clothed with tawny-gray.

Head with frons about as wide as high, broadest below; eyes emarginate, inferior lobes nearly twice as deep as wide, extending three-fifths distance from antennal insertions to bases of mandibles. Antennæ nearly twice as long as body; scape slender, subcylindrical, thickest before apex, nearly reaching base of prothorax, about as long as third segment; fourth segment slightly longer than third; fifth segment subequal to third. Prothorax transverse, constricted near apex and base, broader at latter than at former, central portion swollen, strongly tuberculate at each side and quite prominently tuberculate on each side of middle of disc, with a feeble swelling behind center, apex and base with a few deep punctures. Scutellum trapeziform, concave apically. Elytra broad, narrowed posteriorly, transversely emarginate-truncate apically with external angles dentate; surface longitudinally ribbed, deeply and irregularly punctured, each with two strong tubercles near base and suture, one before the other. Femora pedunculate and strongly clavate; first hind tarsal segment nearly as long as remaining segments combined.

Length, 14 millimeters; breadth, 5.3.

Holotype, female (?), in the Lingnan Natural History Museum, Tai-tsing-lam-ts'uen, near Loi Mother Mountain, central Hainan, June 13 to 16, 1935, F. K. To.

Differs from *Acanista alphoides* Pascoe in having the scape shorter and more cylindrical, the prothorax tuberculate above, the scutellum truncate, the elytra tuberculate, and in other characters.

Distribution.—Hainan Island.

Genus EXOCENTRUS Mulsant

Exocentrus MULSANT, Col. France Longic. (1839) 152; THOMSON, Syst. Cer. (1864) 395; PASCOE, Trans. Ent. Soc. London (3) 3 (1864) 27, 28; LACORDAIRE, Gen. Col. 9 (1872) 800, 805; FISHER, Ind. For. Rec. 16 (1932) 295.

Oligospis THOMSON, Syst. Cer. (1864) 111, 596; LACORDAIRE, Gen. Col. 9 (1872) 806.

Head broad, with antennal insertions distant and vertex hardly concave; antennæ a little longer than body, with suberect bristles; scape long; prothorax short, flattened, expanded, and with a posteriorly projecting tooth behind middle of each side; elytra broad, rounded posteriorly; femora pedunculate-clavate, hind pair reaching to apex of second abdominal segment; body clothed with long, erect hairs or bristles.

Genotype.—*Exocentrus cinereus* Mulsant.

Range.—Palearctic, Ethiopian, Oriental, Oceanic, and Neotropical Regions.

Key to the Hainan species of Exocentrus.

1. Elytra with three narrow, transverse, pale bands..... 2.
Elytra lacking three narrow, transverse, pale bands..... 3.
2. Bases of elytra bright reddish brown..... *basirufus*.
Bases of elytra not reddish nor different in color from remainder.
trifasciellus.
3. Elytra dark reddish brown, with six longitudinal stripes of isolated or partly joined spots *alboguttatus subconjunctus*.
Elytra testaceous brown, with two broken, darker, transverse bands, and a number of irregular isolated spots of various sizes.... *constricticollis*.

EXOCENTRUS ALBOGUTTATUS SUBCONJUNCTUS Gressitt subsp. nov.

Male.—Dull reddish brown, darker on upper part of head, center of prothoracic disc, antennæ, swollen portions of femora, sides of metasternum, and posterior portions of abdominal segments. Surfaces clothed with white pubescence as follows: head thinly, but almost entirely, clothed; antennæ clothed on scape, basal three-fourths of third segment, basal two-thirds of fourth segment, and bases of fifth to seventh segments for successively diminishing lengths; prothorax clothed on middle of disc and sides, former area connected premedially with sides and posteriorly with basal margin; elytra with six or more longitudinal stripes formed of isolated or partly joined spots of white pubescence, and a band at middle which extends obliquely backward to suture; ventral surface thinly clothed with pale pubescence. Bristles moderately short, thick, and dense on elytra, longer and slenderer on antennæ.

Head nearly as broad as prothorax; frons broad, swollen; vertex feebly concave between antennal insertions; eyes with inferior lobes slightly deeper than wide, extending two-thirds distance to bases of mandibles. Antennæ one and two-fifths as long as body; scape subequal in length to third segment; fourth segment two-thirds as long as third. Prothorax about twice as broad as long, narrower at base than at apex, subparallel at

sides, with a short, posteriorly-directed, acute spine before emargination. Elytra quite regularly punctured in about ten longitudinal rows on dorsal surface of each and irregularly on deflexed portions.

Female.—Antennæ one and one-fourth as long as body; prothorax more than twice as broad as long.

Length, 5.7 to 7.4 millimeters; breadth, 2.8 to 3.8.

Holotype, male, in the Lingnan Natural History Museum, Taising-lam-ts'uen, near Lai-mo-ling (Loi Mother Mountain), central Hainan, June 5, 1935, F. K. To; allotype, female, in the author's collection, Tai-pin-ts'uen (Dwa-Bi), altitude 380 meters, near Loi Mother Mountain, May 17, 1935, F. K. To; three paratopotypes in the United States National Museum, and four paratypes from Tai-pin-ts'uen.

Differs from typical *E. alboguttatus* Fisher of India in having the bristles shorter and thicker, the punctures extending farther posteriorly, and the rows of white spots less regular and partly joined.

Distribution.—Hainan Island.

EXOCENTRUS BASIRUFUS Gressitt sp. nov. Plate 5, fig. 16.

Male.—Reddish brown; head, prothorax, and posterior half of elytra nearly black; antennæ blackish brown on apical halves. Head and prothorax very thinly clothed with pale pubescence; scutellum and basal margin of prothorax narrowly clothed with white hairs; elytra crossed by three narrow, incomplete fasciæ of white hairs, first at end of basal quarter, second and third at beginning of apical fifth; posterior borders of abdominal segments edged with white pubescence; bristles long, suberect and thick on dorsal surface of elytra, short and sparse on prothorax, short and dense on head, moderately long on inner sides of antennæ.

Head practically as broad as prothorax, finely punctulate; front less than one and one-half times as wide as high, moderately convex; vertex nearly level between antennal insertions; eyes deeply emarginate, inferior lobes nearly as wide as deep. Antennæ one and one-fourth as long as body, fairly thick; scape subfusiform, following segments cylindrical; third segment two-thirds as long as scape, subequal to fourth and fifth segments; following segments gradually decreasing. Prothorax one and three-fifths as broad as long, as broad at base as at apex, feebly expanded laterally, with a fine, acute tubercle pointing obliquely outward. Scutellum rounded. Elytra deeply punctured in about

thirteen subregular longitudinal rows to apical fifth. Posterior femora reaching to base of fifth abdominal segment; first hind tarsal segment as long as following two segments united.

Length, 3.1 to 4 millimeters; breadth, 1.1 to 1.5.

Holotype, male, in the United States National Museum, Chung-kong-ts'uen, central Hainan, altitude 325 meters, July 18, 1935, taken by the author; paratype, male, in the author's collection, Tsin-leong Shan, near Mei-hsien City, Mei District, eastern Kwangtung Province, southeastern China, altitude 850 meters, June 5, 1936, taken by the author.

Differs from *E. cudraniae* Fisher of India in having the bristles longer, denser, and finer, the head and prothorax black, the punctures larger and more regular, and the elytra more distinctly banded.

Distribution.—Hainan Island; Kwangtung Province.

EXOCENTRUS CONSTRICTICOLLIS Gressitt sp. nov. Plate 5, fig. 12.

Female.—Dull brown, marked with tawny, reddish brown, and blackish: head black, thinly clothed with gray pubescence; clypeus, labrum, bases of mandibles, and apices of genæ reddish; antennæ reddish brown, apices of segments darker; prothorax dull reddish brown, anterior and posterior constricted portions reddish testaceous, disc irregularly clothed with pale pubescence; scutellum densely clothed with pale buff; elytra testaceous-brown, crossed by two broad, irregular, dark-brown bands, one band at about middle, the other apical, as well as some small, lateral, dark spots and fine reticulations, bases reddish brown, pale areas clothed with light-buff pubescence; ventral surface reddish brown, clothed with pale pubescence, pro- and mesosterna and coxæ subtestaceous; tarsi and apical portions of femora and tibiæ darker. Bristles fairly long, thick, and sparse, those on antennæ arising from all sides.

Head broad, moderately convex in front, feebly convex at vertex; occiput smooth, swollen; frons transverse, finely grooved medially, minutely punctulate; eyes with inferior lobes nearly as broad as deep, extending four-fifths distance to bases of mandibles. Antennæ with scape subfusiform, twice as thick as, and one and one-third as long as, third segment; fourth segment subequal to third. Prothorax transverse, strongly constricted basally; lateral spines acute, extending obliquely backwards; surface micropunctulate. Scutellum rounded-triangular. Elytra finely punctured in about six longitudinal rows above, densely punctured on lower parts of sides. First hind tarsal segment barely as long as following two segments united.

Length, 4 millimeters; breadth, 1.4.

Holotype, female, loan deposit, California Academy of Sciences, Ta-hau, westcentral Hainan, altitude 200 meters, July 3, 1935, taken by the author.

Differs from *E. pubescens* Fisher, of India, in having the bristles shorter, thicker, and sparser, the puncture rows fewer, the prothorax more constricted and more strongly spined, and the ground color lighter with the pubescence sparser.

Distribution.—Hainan Island.

EXOCENTRUS TRIFASCIELLUS Gressitt sp. nov. Plate 5, fig. 17.

Male.—Dark reddish brown, brighter on basal half of elytra, nearly black on head, apical portions of elytra, swollen parts of femora, and apices of tibiæ; antennæ, coxæ, bases of tibiæ, and apices of tarsi reddish; body irregularly clothed with thin, white pubescence, arranged in three incomplete, transverse fasciæ, with intervening spots, on elytra: first spot near base, second just before middle, third closer to middle than apices. Bristles on body sparse, thick and fairly long, those on antennæ shorter and slenderer, largely internal.

Head broad, finely punctulate; frons transverse, feebly swollen; vertex plane between antennal insertions; eyes with inferior lobes slightly deeper than wide, extending three-fourths distance to bases of mandibles. Antennæ one and one-half as long as body; scape slender, one and one-third as long as third segment; third to seventh segments hardly decreasing in length. Prothorax twice as broad as long, fully as broad at base as at apex, acutely and obliquely spined laterally. Scutellum short. Elytra conjointly rounded, distinctly punctured in six longitudinal rows on dorsal surface for basal three-fourths. First hind tarsal segment as long as following two segments united.

Length, 3.3 millimeters; breadth, 1.2.

Holotype, male, loan deposit, California Academy of Sciences, Ta-han, central Hainan, altitude 750 meters, June 21, 1935, taken by the author.

Differs from *E. variepennis* (Schwarzer) of Formosa in having the prothorax more expanded laterally, the spines much longer, the punctures sparser, and the bands more anteriorly placed.

Distribution.—Hainan Island.

Genus MIÆNIA Pascoe

Miænia PASCOE, Trans. Ent. Soc. London (3) 3 (1864) 27, 38; LA-CORDAIRE, Gen. Col. 9 (1872) 801, 813.

Head as broad as prothorax; vertex moderately broad, feebly concave; antennæ slender, longer than body; scape much shorter than third segment; third and fourth segments long, subequal; prothorax broader than long, subcylindrical, finely toothed near middle of each side; body lacking erect bristles.

Genotype.—*Miænia marmorea* Pascoe.

Range.—Eastern part of Oriental Region.

MIÆNIA LATERIMACULATA Gressitt sp. nov. Plate 5, fig. 10.

Male.—Dull reddish brown, darker on apical two-thirds of antennæ and on two transverse bands crossing elytra, one centered just before middle, the other at beginning of apical quarter; body largely clothed with thin, pale-gray pubescence, except on elytral fasciæ; legs dark, swollen portions of femora and apices of tibiæ nearly black; a row of short, oblique hairs on inner side of antennæ, a few fine hairs around mouth parts, sides of prothorax, and pro- and mesothoracic sterna.

Head about as broad as prothorax at middle, constricted behind eyes, finely and irregularly punctured; frons slightly wider than high, narrowed above, moderately swollen; vertex feebly concave between antennal insertions; eyes large, approximate above, deeply constricted, inferior lobes rounded, slightly deeper than wide, extending two-thirds distance to bases of mandibles.

Antennæ slender, one and one-half as long as body; scape slender, three-fourths as long as third segment, fourth segment longer than scape, fifth segment three-fifths as long as fourth. Prothorax nearly as long as broad, slightly swollen at sides, finely punctured. Scutellum rounded. Elytra closely punctured in about fifteen more or less regular rows. Sides of metasternum closely punctured. First hind tarsal segment nearly as long as following two segments combined.

Length, 5 millimeters; breadth, 2.2.

Holotype, male, loan deposit, California Academy of Sciences, Ta-han, near Red Mist Mountain (Hung-mo-lia), central Hainan, altitude 750 meters, June 23, 1935, taken by the author.

Differs from *M. subfasciata* Schwarzer of Formosa in having the scape relatively longer; the prothorax shorter and less densely punctured; and the elytra less regularly and less closely punctured, with the bands less distinct and the spots more numerous.

Distribution.—Hainan Island.

Genus RONDIBILIS Thomson

Rondibilis THOMSON, Archives Ent. 1 (1857) 306; Classif. Cer. (1860) 104, 108; Syst. Cer. (1864) 396; LACORDAIRE, Gen. Col. 9 (1872) 796, 797.

Polimeta PASCOE, Trans. Ent. Soc. London (3) 3 (1864) 10, 13.

Head hardly concave between antennal tubercles; frons higher than wide; antennæ a little longer than body, with bristles internally; prothorax distinctly longer than broad, feebly rounded laterally, transversely constricted near base; elytra long and parallel, each with a median postbasal crest bearing a spine anteriorly; posterior tibiæ long.

Genotype.—*Rondibilis bispinosa* Thomson.

Range.—Indo-Malayan, Indo-Chinese, and Indo-Australian Subregions.

RONDIBILIS SEATONI Gressitt sp. nov. Plate 4, fig. 7.

Female.—Dark reddish brown, largely clothed with close pubescence; basal portions of antennæ, bases of tibiæ and tarsi, and bases and apices of femora paler reddish and more thinly pubescent, apical portions of antennæ black; pubescence largely pale cinereous-buff, marked with dark brown as follows: prothorax with a pair of longitudinal stripes from anterior to posterior constrictions, and three spots in a line on each side, at anterior and posterior borders and middle, respectively; elytra with a basal sutural stripe, bordering scutellum and breaking up into isolated small spots after basal third, a more complete stripe along each lateral declivity, and two sublateral, transverse marks, the first just behind middle, suboblique, the second near beginning of apical quarter, both extending about two-thirds distance from margin toward suture. Bristles short, oblique, subseriately arranged on elytra, lacking on prothorax and legs.

Head minutely punctulate, shallowly concave between antennal insertions, which are raised; frons squarish; eyes deeply emarginate, inferior lobes as wide as deep. Antennæ one and one-half as long as body, scape subfusiform, three-fifths as long as third segment; fourth segment equal to third, barely longer than fifth segment. Prothorax a little longer than broad, constricted near base and apex, middle portions swollen at sides. Elytra narrow, emarginate-truncate apically, irregular and finely punctured on inner portions, bristles arising from punctures; first hind tarsal segment slightly longer than remaining segments combined.

Length, 11 millimeters; breadth, 2.8.

Holotype, female, in the Lingnan Natural History Museum, Kachek, eastern Hainan, altitude 20 meters, May 13 to 16, 1932, F. K. To; allotype, male, in the author's collection, Chung-kon-ts'uen, central Hainan, altitude 325 meters, July 18, 1935, taken by the author; three paratypes, in the Lingnan Natural History Museum, Nam-liu-tin, Kiung-shan District, July 26 to August 3, 1935, F. K. To; two paratypes, females, Dwa-Bi (Tai-pin-ts'uen) July 20 to 23, 1935, F. K. To and the author, No. 53450 United States National Museum; three paratypes, Tai-tsing-lam-ts'uen, near Loi Mother Mountain, June 5 to 18, 1935, F. K. To; one paratype, No. 53450 United States National History Museum.

Differs from *R. horiensis* Kano in being less densely punctured and spined on elytra, with the prothorax more constricted, the elytra with partial bands instead of numerous spots, and in other characters.

Named in honor of Dr. S. P. Seaton, of the American Presbyterian Mission in Hainan, as a slight token of extensive assistance and kindness tendered by him and Mrs. Seaton to the author during part of his sojourn on the island.

Distribution.—Hainan Island.

Genus *OSTEDES* Pascoe

Ostodes PASCOE, Trans. Ent. Soc. London (2) 4 (1859) 43; *ibid.* (3) 3 (1864) 10, 14; THOMSON, Syst. Cer. (1864) 396; LACORDAIRE, Gen. Col. 9 (1872) 795, 796.

Head broad, moderately convex between antennal insertions; frons much wider than high; antennæ a little longer than body, internally with erect hairs; scape subfusiform, third and fourth segments subequal in length; prothorax longer than broad, swollen and tuberculate at each side and constricted near apex and base; elytra long, narrowed posteriorly, a small tubercle near base of each.

Genotype.—*Ostodes pauperata* Pascoe.

Range.—Indo-Chinese, Indo-Malayan, and Indo-Australian Subregions.

OSTEDES INERMIS DWABINUS Gressitt subsp. nov.

Male.—Dark rusty brown, varied with lighter and darker and partially clothed with silvery-buff pubescence. Head dark brown, thinly clothed with pubescence, except for some small round dots; antennæ reddish brown near base, darker apically, basal quarter or third of third and following segments clothed

with pale-buff pubescence; prothorax reddish brown, darker on sides of disc, partially clothed with silvery buff, leaving small, dark dots that converge on each side of disc before middle, forming larger blotches; scutellum light reddish, thinly pubescent; elytra dark brown subbasally, laterally, and medially, with extreme bases, a large anterior circular area, suture at middle, and a large, irregular, postmedian area extending nearly to apices, of light reddish brown clothed with pale-buff pubescence and dotted with dark punctures; ventral surface dull reddish brown, duller on metasternum, evenly clothed with thin, pale pubescence; legs reddish brown, swollen portions of femora and apical portions of tibiae nearly black, middle portions of tibiae and basal two-thirds of first tarsal segment densely clothed with pale-buff pubescence. Body above, legs and antennae internally, clothed irregularly with suberect, black bristles.

Head broader than base of prothorax, feebly convex anteriorly, rounded-concave between antennal insertions, sparsely punctured; frons broad, medially grooved; eyes deeply emarginate, inferior lobes broader than deep, indenting frons. Antennae one and one-half times as long as body; scape feebly swollen, a little shorter than third segment; fourth segment slightly longer than third and fifth segments, which are subequal. Prothorax longer than broad, constricted near base and apex, expanded laterally, bearing a thick, short, blunt, posteriorly curved tubercle at middle of each side; surface finely and sparsely punctured. Elytra narrowed and subobliquely truncate apically, deeply and irregularly punctured. Tibiae and tarsi slender; first hind tarsal segment nearly as long as remaining segments combined.

Length, 10.5 millimeters; breadth, 2.8.

Female.—Antennae one and one-sixth as long as body.

Length, 12.4 millimeters; breadth, 3.6.

Holotype, male, in the Lingnan Natural History Museum, Taipei-ts'uen (Dwa-Bi), near Loi Mother Mountain, central Hainan, May 17, 1935, F. K. To; allotype, female, in the author's collection, July 23.

Differs from *O. inermis* Schwarzer of Formosa in being more reddish, more densely punctured, with longer and sparser bristles, the prothorax longer, less prominently tuberculate and more even on disc.

Distribution.—Hainan Island.

HIPPOPSINI

HIPPOPSITÆ Thomson, Classif. Cer. (1860) 124, part; Syst. Cer. (1864) 97, 389.

HIPPOPSINÆ Pascoe, Trans. Ent. Soc. London (3) 3 (1869) 323.

HIPPOPSIDES Lacordaire, Gen. Col. 9 (1872) 414, 690.

HIPPOPSINI Aurivillius, Col. Cat. 74 (1923) 353; Liu, Lingnan Sci. Journ. 13 (1933) 240, 247, 650.

Form elongate; head more or less oblique, vertex acute, mouth parts directed posteriorly; frons long, broader below than above; antennæ slender, generally more than twice as long as body, ciliated below; scape generally long; prothorax cylindrical, unarmed; elytra long; anterior coxal cavities closed posteriorly, somewhat angulate exteriorly; middle coxal cavities open externally to epimera; posterior femora much shorter than abdomen; tarsal claws divergent.

Genus POTHYNE Thomson

Pothyne THOMSON, Syst. Cer. (1864) 97; PASCOE, Trans. Ent. Soc. London (3) (1869) 691, 694; LIU, Lingnan Sci. Journ. 13 (1933) 248.

Head moderately acute, slightly concave between antennal insertions, not distant from anterior coxæ; frons deep, slightly narrowed above; inferior eye lobes deep and narrow; antennæ one and one-half to three times as long as body; scape cylindrical, nearly reaching base of elytra, subequal in length to third and fourth segments; prothorax cylindrical, a little longer than broad; elytra long, broader than prothorax, subparallel, rounded or truncate apically; posterior femora reaching to apex of first or to middle of second, abdominal segment; first hind tarsal segment distinctly shorter than following two segments united.

Genotype.—*Pothyne variegata* Thomson.

Range.—Oriental Region; southern Japan.

Key to the Hainan species of Pothyne.

1. Prothorax no longer, or hardly longer, than broad; scape thick, subcylindrical; pronotum sparsely or coarsely punctured..... 2.
Prothorax distinctly longer than broad; scape slender, long; pronotum finely, somewhat closely, punctured..... 4.
2. Occiput punctured; frons not asperate-punctate in male; scape clothed with short, obliquely erect hairs..... 3.
Occiput impunctate; frons asperate-punctate in male; scape lacking short, obliquely erect hairs..... *rugifrons*.
3. Elytra with narrow, longitudinal stripes of buffy-yellow pubescence; elytral apices rounded; scape rugulose *chocolata*.

- Elytra with a number of alternating grayish tawny and yellow pubescent stripes, with short, irregular crossbars; elytral apices subemarginate-truncate; scape micropunctulate *lineolata*.
4. Vertex narrowly concave between antennal supports; antennal scape cylindrical or subfusiform; elytra irregularly punctured..... 5.
Vertex shallowly and broadly concave between antennal supports; antennal scape gradually thickened to just before apex; elytra in large part regularly seriate-punctate..... *seriata*.
5. Scape subfusiform, shorter than third antennal segment; elytral apices subtransversely emarginate-truncate; dorsal surfaces subglabrous with tawny-yellow stripes *fusiscapa*.
Scape cylindrical, as long as third antennal segment; elytral apices obliquely truncate; dorsal surfaces with whitish-buff pubescence with buffy-yellow stripes *obliquetruncata*.

POTHYNE CHOCOLATA Gressitt. Plate 4, fig. 17.

Pothyne chocolata GRESSITT, Lingnan Sci. Journ. 18 (1939) 88, Kwangtung, Kiangsi, and Hunan Provinces.

Male.—Reddish brown to chocolate-brown; elytra largely reddish; frons and parts of femora blackish. Surfaces in part clothed with grayish-white or pale-tawny pubescence: head irregularly clothed with pale tawny in front and densely so behind eyes; antennæ with sparse, pale-buff pubescence and with long, black hairs on undersides of first five segments; prothorax with scattered buffy hairs and seven longitudinal, pale-tawny stripes of denser pubescence, those on notal disc somewhat incomplete; scutellum tawny at sides; each elytron with about six narrow longitudinal stripes of tawny-buff pubescence, and some scattered hairs of the same color; ventral surfaces sparsely clothed with tawny-buff, thoracic pleura with dense, creamy-buff pubescence.

Head deeply punctured in front and between upper eye lobes. Antennæ 12-segmented, a little more than twice as long as body; scape subcylindrical, slightly narrowed apically, barely longer than broad, deeply punctured to near apices.

Length, 12.7 millimeters; breadth, 3.3.

Female.—More chocolate-brown and less reddish; antennal fringe shorter and less dense; antennæ hardly twice as long as body.

Length, 14 millimeters; breadth, 3.6.

One male, in the Lingnan Natural History Museum, taken at Ngai-chau, Yai District, southern Hainan, May 20 to 27, 1932, by W. E. Hoffmann and O. K. Lau; 1 female, in the author's collection, taken at Ta-hau, near Vo-lau, western Hainan, July 5, 1935, by the author.

New to Hainan.

Distribution.—Kwangtung; Kwangsi; Hunan; Hainan Island.

POTHYNE FUSISCAPA Gressitt sp. nov.

Male.—Body dark chocolate-brown, reddish brown on antennæ (beyond scape); mouth parts; apical and basal margins of prothorax; a median and a sublateral longitudinal stripe, and external margin, of each elytron; and along middle of thoracic and abdominal sternites; legs dark reddish brown. Surfaces clothed with grayish to tawny-yellow pubescence: head and ventral surfaces thinly and entirely clothed with tawny-yellow, more dense and more yellowish on thoracic pleura and lateral edges of abdominal sterna; antennæ thinly pubescent, with relatively short, oblique, black, flying hairs on undersides of first four segments; prothorax with seven longitudinal stripes of tawny-yellow, lower two on each side narrowly separated, interspaces with minute, pale hairs; scutellum tawny-yellow; elytra with very thin and sparse, pale hairs, each with suture, external margin, a moderately broad median, and a similar sublateral stripe and two narrower stripes, one between the two afore-mentioned, the other between median stripe and suture.

Head as broad as prothorax; frons trapezoidal, deeply and evenly punctured; inferior eye lobes one and one-fourth as deep as wide, occupying a little more than one-half distance between antennal supports and genal margins. Antennæ 12-segmented, two and one-half times as long as body, very slender; scape slender, fusiform-cylindrical, micropunctulate, a little shorter than third segment; fourth segment slightly longer than third; fifth to tenth segments shorter, subequal. Prothorax a little longer than broad, cylindrical, slightly constricted near base; surfaces finely punctured, somewhat sparsely so on notum. Elytra parallel, narrowly and subobliquely emarginate-truncate apically, with external angles slightly produced; surfaces irregularly and rather heavily punctured nearly to apices.

Length, 10.6 millimeters; breadth, 2.75.

Holotype, female, loan deposit, California Academy of Sciences, Dome Mountain (Sa-bo-leng, Sa-ko-lia), 8 kilometers west of Nam-fung, Hainan, July 13, 1935, taken by the author.

Differs from most species of *Pothyne* in having the scape slender, subfusiform, and shorter than the third antennal segment. Differs from *P. chocolata* Gressitt in having the elytra truncate instead of rounded apically, the scape longer, smoother, and slenderer, and in other characters.

Distribution.—Hainan Island.

POTHYNE LINEOLATA Gressitt sp. nov.

Male.—Subparallel, dorsoventrally somewhat compressed. Reddish brown, dark brown at apices of antennal segments, on middle of metasternum, and sides of abdominal sternites, blackish on frons, vertex, parts of occiput, pronotal disc, metasternal-episternal suture, thickest portions of femora, and basal segments of tarsi. Body surfaces almost entirely clothed with tawny-buff, whitish buff, or grayish, pubescence of varying thicknesses, largely in stripes dorsally: head whitish, tinged with buff in front, tawny-buff at sides; antennæ with fairly dense, oblique, whitish pile on scape and bases of third to fifth segments, remainder with short, sparse, gray-brown hairs, undersides of first seven segments with long, flying, blackish hairs; prothorax sparsely clothed with tawny-gray pubescence and with seven narrow, longitudinal stripes of thick, ochraceous pubescence; scutellum edged with whitish and tawny hairs; each elytron with eight or nine alternating stripes of tawny-buff and whitish gray, suture tawny, external margin gray, stripes in part with branchlike connections with adjacent stripes; ventral surfaces clothed with grayish white, somewhat tawny at sides; legs clothed with whitish buff, grayish white on tarsi.

Head fully as broad as prothorax, deeply punctured on frons and middle of occiput; inferior eye lobes large, one and one-half as deep as wide, occupying nearly three-fourths distance between antennal supports and genal margins. Antennæ 11-segmented, one and three-fourths as long as body, tapering; scape nearly cylindrical, finely punctulate, a little longer than third segment; third to seventh segments subequal in length; last segment nearly as long as scape. Prothorax cylindrical, hardly longer than broad, slightly constricted near base, shallowly and irregularly punctured. Scutellum broadly rounded. Elytra narrowed and subemarginate-truncate apically; surfaces closely, irregularly, and somewhat finely punctured. Posterior femora barely reaching beyond first abdominal segment.

Length, 14.8 millimeters; breadth, 3.7.

Holotype, male, in the Lingnan Natural History Museum, Cheung-kon-ts'uen, Ka-luk-kong, 30 kilometers east of Nam-fung, Kiung-shan District, April 11 and 12, 1935, F. K. To.

Differs from *P. variegata* Thomson in being slenderer, in having the antennæ composed of eleven instead of twelve segments and slenderer, the elytral stripes frequently interrupted, and in other characters.

Distribution.—Hainan Island.

POTHYNE OBLIQUETRUNCATA Gressitt. Plate 4, fig. 16.

Pothyne obliquetruncata GRESSITT, Lingnan Sci. Journ. 18 (1939) 89, northern and eastern Kwangtung.

Male.—Slender, cylindrical. Reddish brown, blackish brown at extreme apices of third to sixth and last antennal segments and on sides of occiput, pronotal disc, humeri, and parts of lateral portions of metasternum and abdominal segments. Surfaces clothed with thin grayish white, and stripes of tawny-yellow, pubescence: head sparsely tawny with denser, yellow pubescence on anterior borders of genæ and behind eyes; prothorax thinly grayish white, with seven yellow stripes; elytra similarly clothed, but with five stripes on each; ventral surfaces thinly grayish white, with denser yellow pubescence on thoracic pleura. First five antennal segments fringed, with black hairs internally.

Head asperate-punctate on frons, distinctly punctured on occiput. Antennæ two and one-half times as long as body; scape cylindrical, about as long as third segment. Prothorax a little longer than broad, cylindrical, finely and irregularly punctured. Elytra deeply punctured to near apices, the latter obliquely truncate. Length, 11 to 14.5 millimeters; breadth, 2.6 to 3.1.

Female.—Antennæ more than twice as long as body, ventral fringe much shorter; frons deeply, but not asperately, punctured. Length, 12.6 to 15.7 millimeters; breadth, 2.8 to 3.3.

Eight males and 3 females, in the Lingnan Natural History Museum, the author's collection, and the California Academy of Sciences, taken as follows: 1 each at Yin-ko-au, west of Lai-mo-ling, central Hainan, June 23 and 24, 1935, F. K. To; top of Lin-fa-ling, near Kuen-yan-ngan, east of Nodoa, August 6 to 9, 1929, Lingnan Univ. Fifth Hainan Exped.; Nodoa, May 31, Dome Mountain (Sa-bo-ling), July 13, Chung-kon-ts'uen, July 19, Dwa-Bi (Tai-pin-ts'uen) July 24, and Liamui (Leng-moon), August 3, 1935, taken by the author.

Distribution.—Kwangtung; Kwangsi; Hunan; Hainan Island.

POTHYNE RUGIFRONS Gressitt sp. nov.

Male.—Moderately large, subcylindrical. Dark reddish brown, nearly black on head, scape, pronotal disc, humeri, femora, and metasternum. Body surfaces very thinly clothed with grayish-tawny pubescence, and marked with the following stripes of tawny yellow: narrowly on sides of frons, on postgenæ behind eyes; five narrow longitudinal stripes, and lower parts of sides, on prothorax, and on sutural and external margins; four discal

stripes on each elytron; a stripe of very dense pubescence on meso- and metathoracic pleura, forming continuations of area on lower part of each side of prothorax; antennæ sparsely pubescent, a few paler hairs at bases of fourth and following segments, first five segments internally fringed with very long, blackish hairs.

Head strongly asperate-punctate, in part medially carinate, on frons; inferior eye lobes one and one-half as high as wide, occupying a little more than one-half distance from antennal insertions to genal margins. Antennæ about twice as long as body; scape cylindrical, finely punctulate, practically as long as third segment; third and following segments gradually decreasing in length. Prothorax cylindrical, slightly broader at anterior margin, hardly longer than broad; surfaces sparsely and shallowly punctured. Elytra irregularly and rather heavily punctured, narrowly and subobliquely truncate apically, external angles briefly acute.

Length, 14 millimeters; breadth, 3.6.

Holotype, male, in the Lingnan Natural History Museum, Cheung-kon-ts'uen, Ka-luk-kong, 30 kilometers east of Nam-fung, Kiung-shan District, April 13 and 14, 1935, F. K. To.

Differs from *P. chocolata* Gressitt in having the frons coarsely asperate-punctate, the scape without short, oblique hairs, the elytral stripes uninterrupted, and in other respects.

Distribution.—Hainan Island.

POTHYNE SERIATA Gressitt sp. nov. Plate 4, fig. 15.

Female.—Small, cylindrical. Body dark chocolate-brown, reddish brown on labrum, third to fifth antennal segments, lateral, posteriosubsutural, and raised submedian, portions of each elytron, and median portions of metasternum and abdominal sternites. Surfaces clothed with tawny-yellow on frons and more densely with golden pubescence on middle of occiput and sides behind eyes; antennæ thinly clothed with minute, oblique hairs, lacking long flying hairs beneath; prothorax with very thin tawny-yellow, and fine stripes of dense golden, pubescence; scutellum golden; each elytron clothed with dense, golden pubescence on lateral portion, raised submedian stripe, basal two-fifths of suture, and parasutural area in apical half, a fine, tawny-yellow stripe between submedian stripe and lateral stripe, remainder of surface with sparse, grayish-tawny pubescence; ventral surfaces thinly clothed with golden-yellow, thoracic pleura densely so.

Head barely broader than prothorax, shallowly concave and not very narrow between antennal insertions; frons deeply and sparsely punctured; inferior eye lobes nearly as wide as deep. Antennæ 12-segmented, very slender, three times as long as body; scape slender, gradually thickened to just before apex, subequal in length to third segment; third and following segments gradually increasing in length and decreasing in diameter. Prothorax longer than broad, cylindrical, slightly broadened at apex, three-fourths as broad as elytra; surfaces deeply and irregularly punctured. Elytra narrowly truncate apically with external angles feebly dentate; surface of each seriate-punctate except just external to median line, a slightly raised stripe bearing a single row of punctures on basal three-fifths and lacking punctures posteriorly, just internal to median line.

Length 9.2 millimeters; breadth, 2.

Holotype, female, loan deposit, California Academy of Sciences, Ta-han, near Red Mist Mountain, central Hainan, altitude 750 meters, June 22, 1935, taken by the author.

Differs from most species of *Pothyne* in having the antennal supports somewhat widely separated, the antennal scape gradually thickened, and the elytra seriate-punctate. Differs from *P. fusiscapa* in having the vertex more shallowly concave, the scape as long as the third antennal segment and gradually thickened, and in other respects.

Distribution.—Hainan Island.

SPALACOPSINI

APROSOPITÆ Thomson, Syst. Cer. (1864) 95, 398, part.

SPALACOPSIDES Lacordaire, Gen. Col. 9 (1872) 414, 702.

SPALACOPSINI Aurivillius, Col. Cat. 74 (1923) 360.

Slender; head strongly produced anteriorly; mouth parts directed backward; eyes divided; antennæ hardly longer than body; scape large; prothorax cylindrical, as broad as head and elytral bases; anterior coxal cavities angulate externally; middle coxal cavities open externally to epimera; middle tibiæ grooved preapically on outer sides; tarsal claws divergent.

Genus TETRAGLENES Newman

Tetraglenes NEWMAN, Entomologist 1 (1842) 300; THOMSON, Syst. Cer. (1864) 388; PASCOE, Trans. Ent. Soc. London (3) 3 (1866) 323, 325; LACORDAIRE, Gen. Col. 9 (1872) 702, 703.

Head nearly as long as prothorax; antennæ about as long as body; scape stout, nearly as long as third and fourth segments

combined; third and following segments with a fringe of long hairs; elytra fusiform, separately acuminate apically; legs short; posterior femora reaching only to apex of first abdominal segment.

Genotype.—*Tetraglenes insignis* Newman.

Range.—Ethiopian and Oriental Regions.

TETRAGLENES INSIGNIS SUBLINEATUS Gressitt. Plate 4, fig. 18.

Tetraglenes sublineatus GRESSITT, Lingnan Sci. Journ. 14 (1935) 572, Foochow, Fukien Province.

Tetraglenes insignis sublineatus GRESSITT, Lingnan Sci. Journ. 16 (1937) 613; *ibid.* 18 (1939) 90, Kwangtung.

Brownish black, elytra reddish brown mixed with black; surfaces irregularly clothed with tawny, gray, buff, or whitish pubescence: head dull tawny-brown, buffy on frons and postocciput, blackish behind eyes; antennæ tawny on scape, sparsely pubescent and fringed on remainder; prothorax tawny, with three longitudinal, blackish-brown stripes on notum and one along each side; elytra largely tawny or buffy, whitish along median ridge on basal half, subglabrous on black portions; ventral surfaces largely clothed with buffy, pinkish brown along middle of sternites, blackish brown at sides.

Head finely punctured; superior eye lobe slightly smaller than inferior eye lobe. Antennæ as long as body; scape as long as prothorax, deeply punctured. Prothorax subcylindrical, with three shallow, longitudinal grooves. Elytra ridged medially on basal portion and externally on apical portion, their surfaces closely punctured.

Length, 9 to 11 millimeters; breadth, 1.6 to 1.75.

Three specimens from Ta-hian, near foot of Five Finger Mountains, June 12 to 17, 1 from Ta-han, near Red Mist Mountain, June 7, 1 from Ta-hau, west of Nodoa, July 7, and 1 from Chung-kon, east of Nam-fung, July 19, 1935, collected by the author; 1 taken at Nam-fung, June 24, 1932, by F. K. To.

New to Hainan.

Distribution.—Fukien; Kwangtung; Hainan.

SAPERDINI

SAPERDAIRES Mulsant, Col. France Long. (1839) 181.

SAPERDINÆ Pascoe, Trans. Ent. Soc. London (3) 3 (1866) 327.

SAPERDIDES Lacordaire, Gen. Col. 9 (1869) 831.

SAPERDINI Leconte, Smiths. Misc. Coll. (9) 265 (1873) 331, 345.

Eyes finely faceted, emarginate; antennal scape gradually thickened; prothorax rarely armed laterally; middle tibiæ not

grooved or toothed externally; anterior coxal cavities angulate externally; pro- and mesosternal intercoxal processes depressed, unarmed; middle coxal cavities open externally to epimera; last tarsal segment relatively short; tarsal claws divaricate.

Key to the Hainan genera of Saperdini.

- Head narrower than prothorax; prothorax bluntly tuberculate laterally; antennæ barely longer than body; mandibles as deep as frons; over 12 millimeters long *Glenida*.
 Head broader than prothorax; prothorax cylindrical; antennæ slender, distinctly longer than body; mandibles much less in depth than frons; under 10 millimeters long *Serixia*.

Genus SERIXIA Pascoe

Serexia PASCOE, Trans. Ent. Soc. London (2) 4 (1856) 45; *ibid.* (3) 3 (1866) 329; Journ. Ent. 1 (1862) 353; THOMSON, Syst. Cer. (1864) 399; LACORDAIRE, Gen. Col. 9 (1872) 832, 839.

Iole PASCOE, Trans. Ent. Soc. London (2) 4 (1858) 254.

Iolea PASCOE, Journ. Ent. 1 (1862) 353; THOMSON, Syst. Cer. (1864) 398.

Head wider than prothorax; eyes deeply emarginate, swollen; antennæ generally much longer than body in both sexes, slender, segments, except second, subequal in length; prothorax subcylindrical, disc swollen posteriorly; scutellum minute, squarish; elytra parallel, rounded apically, generally smooth and seriate-punctate above; anterior and middle coxæ subapproximate, fairly prominent, acetabula of former closed posteriorly; metepisternum fairly broad, narrowed posteriorly; last abdominal segment of female long, swollen and finely grooved medially; legs slender; tarsi short.

Genotype.—*Serixia apicalis* Pascoe.

Range.—Malay Archipelago, including Philippines; peninsula of southeastern Asia; South China; Hainan; Formosa.

Key to the Hainan species of Serixia.

1. Scape black; body slender..... 2.
 Scape testaceous; body very short..... *abbreviata*.
2. Elytra black apically; posterior femora not nearly reaching elytral apices; antennæ less than twice as long as body..... *sedata*.
 Elytra entirely testaceous; posterior femora nearly reaching elytral apices; antennæ more than twice as long as body..... *longicornis pubescens*.

SERIXIA ABBREVIATA Gressitt sp. nov. Plate 5, fig. 7.

Male.—Abbreviated, parallel, depressed-cylindrical. Testaceous; head and prothorax subochraceous; eyes and apices of mandibles black; antennæ testaceous on basal three and one-half

segments, remainder black; legs pale testaceous. Body clothed with short, suberect, pale hairs, longest on front of head and base of elytra, as well as fine, golden pubescence, giving a silky sheen on head, prothorax, and ventral surfaces; antennæ with short, pale pubescence, and a few fine, erect, golden hairs on scape and inner side of each to middle of fourth segment, remainder with very short, black pubescence.

Head as wide as deep, distinctly wider than prothorax, finely and sparsely punctured, except on occiput and genæ; labrum heavily punctured; frons wider than high, weakly swollen, emarginate laterally; vertex nearly plane between antennal insertions, finely grooved along middle; each eye with inferior lobe nearly round, occupying nearly two-thirds distance from antennal insertions to base of mandibles. Antennæ less than twice as long as body; scape slightly thickened towards apex, fully as long as third segment; third segment slightly longer than fourth, fourth segment barely longer than fifth. Prothorax one and one-third as broad as long, subcylindrical, constricted prebasally; disc weakly swollen behind center, finely punctured on each side and nearly impunctate along middle. Elytra less than twice as long as broad, parallel, each broadly rounded apically and impressed with a subsutural groove, seven longitudinal rows of fine punctures on dorsal surface; deflexed sides irregularly punctate; apical portion indistinctly punctured. Metasternum swollen, nearly impunctate. First abdominal segment nearly as long as following three segments combined; last segment rounded-truncate apically. Posterior femora reaching elytral apices.

Length, 5 millimeters; breadth, 1.75.

Holotype, male, loan deposit, California Academy of Sciences, Ta-hau, 40 kilometers westsouthwest of Nodoa, Hainan, altitude 180 meters, July 7, 1935, taken by the author.

Differs from *S. sedata* Pascoe in being much more abbreviated; in having the occiput more swollen; the prothorax less closely, and the elytra less distinctly, punctured; the antennæ testaceous basally and black apically, instead of being partly annulated; and the elytra entirely pale.

Distribution.—Hainan Island.

SERIXIA LONGICORNIS PUBESCENS Gressitt subsp. nov. Plate 5, fig. 4.

Male.—Moderately slender, parallel, subcylindrical. Testaceous, somewhat reddish on head, prothorax, and ventral surfaces; antennæ brownish testaceous, first and second segments black, apices of following segments blackish brown. Body

clothed with sparse, erect, pale hairs and fine, golden pubescence, densest on elytra.

Head transverse, nearly one and one-half as broad as prothorax, finely and sparsely punctured; frons wider than high, very weakly swollen, labrum narrow; vertex plane; eyes deeply emarginate, inferior lobes swollen, hemispherical. Antennæ two and two-thirds times as long as body, very slender; scape three-fourths as long as third segment; third and following segments subequal in length. Prothorax as long as broad, subcylindrical, slightly constricted before base and broadened beyond middle; surface very finely and irregularly punctured, moderately swollen on middle of disc. Scutellum emarginate behind. Elytra three times as long as broad, parallel, rounded apically; surfaces seriate-punctate for entire length, in seven rows on each at middle, punctures mostly no more than a puncture width apart longitudinally. Ventral surfaces nearly impunctate. Hind legs slender; posterior femora nearly reaching apices of elytra.

Female.—Antennæ two and one-third times as long as body; last abdominal segment grooved medially, longer than two preceding segments combined.

Length, 5.5 to 6.5 millimeters; breadth, 1.5 to 1.75.

Holotype, male, in the Lingnan Natural History Museum, Taichau Island (Tinhosa), Wan-ning District, 18° 40' north latitude, 110° 30' east longitude, off Hainan Island, June 2, 1932, W. E. Hoffmann and O. K. Lau; allotype, in the author's collection, Nodda, Hainan Island, July 11, 1935, taken by the author; paratype, male, No. 53451 United States National Museum, Chue-mo-ling, northeast of Nodda, Hainan, August 24, 1929, Lingnan Univ. Fifth Hainan Exped.

Differs from *S. longicornis* Pascoe in being slenderer, more reddish, and more pubescent; and from *S. sedata* Pascoe in being slenderer, with the head broader, the antennæ longer and largely testaceous, and the elytra entirely testaceous. Differs from *S. subsericea* Gressitt of Formosa in being slenderer and paler, with the legs entirely testaceous, and the antennæ more extensively so.

Distribution.—Hainan and Tinhosa Islands.

SERIXIA SEDATA Pascoe. Plate 5, fig. 3.

Serixia sedata PASCOE, Journ. Ent. 1 (1862) 354, Siam; GAHAN, Ann. & Mag. Nat. Hist. (7) 5 (1900) 392, Hainan, Burma.

Yellowish testaceous; eyes, tips of mandibles, and apical sixth of elytra black; antennæ black except for basal halves of fourth to ninth segments in male and basal halves of fourth and sixth

segments and extreme bases of fifth, seventh, and eighth segments in female. Body largely clothed with fine, golden pubescence, and short, erect, pale hairs; antennæ with a sparse fringe of black hairs on undersides of second, third, and basal half of fourth, segments.

Head but slightly broader than prothorax, finely and sparsely punctured, feebly convex in front. Antennæ one and one-half to one and three-fourths times as long as body; scape four-fifths as long as third segment, subequal to fourth. Prothorax a little broader than long, finely and irregularly punctured. Scutellum truncate. Elytra two and one-half times as long as broad, slightly broadened posteriorly in female, quite regularly punctured in about nine rows nearly to apices. Posterior femora slightly thickened.

Length, 5 to 8 millimeters; breadth, 1.7 to 3.

One specimen, taken at Ta-hian, southcentral Hainan, altitude 600 meters, June 15, 1 at Ta-hau, western Hainan, altitude 180 meters, July 7, 1935, by the author; a large series was collected at No-kyu-chun, central Hainan, March 22, 1936, by the author's native collector; duplicates deposited in various collections; numerous examples, taken at Tai-pin-ts'uen, May, and Cheung-konts'uen, April 1935, F. K. To; 4 specimens, in the British Museum, recorded by Gahan, taken by Whitehead in 1899.

Distribution.—Siam; Burma; Annam; Hainan.

Genus GLENIDA Gahan

Glenida GAHAN, Ann. & Mag. Nat. Hist. (6) 2 (1888) 65.

Head broad at genæ; frons plane, subtrapeziform; occiput raised, forming an obtuse angle with frons; antennæ about as long as body, scape as long as fourth segment; prothorax transverse, briefly and bluntly tuberculate at each side just before middle, disc on midline behind center and one at each side before middle; scutellum rounded-triangular and bilobed apically; elytra broad, rounded apically, bicarinate laterally to apical third, deeply punctured basally; posterior femora not reaching last abdominal segment.

Genotype.—*Glenida suffusa* Gahan.

Range.—South China; Hainan; Formosa.

GLENIDA CYANEIPENNIS Gahan. Plate 6, fig. 1.

Glenida cyaneipennis GAHAN, Ann. & Mag. Nat. Hist. (6) 2 (1888) 66, China; WATERHOUSE, Aid Ident. Ins. 2 (1890) pl. 181, fig. 3; GRESSITT, Lingnan Sci. Journ. 18 (1939) 93.

Male.—Orange testaceous; elytra metallic purplish violet; apical seven and one-half antennal segments, a small spot on each side of prothorax, tibiae largely, and tarsi entirely, black. Orange portions clothed with golden pubescence, dark portions with short, black pubescence and erect, black hairs.

Head weakly concave between antennal insertions; antennae as long as body; scape apically cylindrical; elytra broad, conjointly rounded apically, irregularly punctured on basal three-fifths.

Length, 14 millimeters; breadth, 5.8.

A single male was taken at Sam-a, southern Hainan, April 30, 1936, by Commander G. Ros, and is in the Musée Heude.

New to Hainan Island.

This example differs from specimens from mainland Kwangtung in having the antennae more extensively black, the elytra more purplish than cyaneous, the ventral surface more ochraceous than yellow, and the head and prothorax more densely pubescent.

Distribution.—South China; Hainan.

GLENEINI

GLENEITÆ Thomson, Syst. Cer. (1864) 123, 401.

GLENEIDES Lacordaire, Gen. Col. 9 (1872) 841.

GLENEINI Aurivillius, Col. Cat. 74 (1923) 494.

Antennal insertions distant, feebly raised; eyes finely faceted, emarginate; antennae but slightly longer than body; anterior coxal cavities angulate externally; middle coxal cavities open to epimera; middle tibiae obliquely grooved; tarsal claws divaricate, generally toothed beneath in male.

Genus GLENEA Newman

Glenea NEWMAN, Entomologist 1 (1842) 301; PASCOE, Trans. Ent. Soc. London (3) 3 (1867) 363, 364; LACORDAIRE, Gen. Col. 9 (1872) 842, 843; AURIVILLIUS, Arkiv. f. Zoologi (13) 9 (1920) 30.

Frons higher than wide, emarginate laterally; vertex shallowly concave; antennae not much longer than body; prothorax subcylindrical; elytra broader than prothorax, gradually narrowed, carinate laterally, truncate apically, with external angles angulate or acuminate; first abdominal sternite much longer than second, third, or fourth.

Genotype.—*Glenea lepida* Newman.

Range.—Ethiopian and Oriental Regions; Manchurian and Indo-Australian Subregions.

teriorly, nearly impunctate on basal third. Elytra cuneiform, truncate apically, with external angles strongly, and internal angles briefly, acuminate; surface of each with an oblique, raised line along disc and two carinæ along side, densely punctured on central portions, more deeply and sparsely so on base.

Length, 10 to 15 millimeters; breadth, 3 to 5.

Holotype, male, No. 52174 United States National Museum, Liamui, (Leng-moon), east central Hainan Island, August 1, 1935, taken by the author; allotype, female, in the Lingnan Natural History Museum, Faan-na, 9 miles south of Nodoa, Tan District, Hainan, July 10 and 11, 1932, F. K. To; paratypes, in the author's collection, Lingnan Natural History Museum, Musée Heude, British Museum, and the California Academy of Sciences, Chung-mei, August 1932, Fang-no, July 11, 1932, Ying-ko-au, near Loi Mother Mountain, June 23 and 24, 1935, Nodoa, March 18 to 22, 1935, F. K. To; Ta-hian, June 12 to 15, 1935, taken by the author, and from other localities.

Differs from *G. relictæ* Bates in being larger, in having the third antennal segment much thicker and hairy apically, and the body entirely bright brick-red with yellow-orange markings.

Distribution.—Hainan.

GLENEA HUMEROSA Gressitt sp. nov. Plate 6, fig. 4.

Male.—Broad at humeri, attenuated posteriorly. Body entirely black, in part clothed with thick, silvery-white pubescence: head with genæ, anterior borders of eyes, and two parallel stripes between upper eye lobes white, remainder of frons thinly pubescent; prothorax with a middorsal stripe and sides to just above middle densely clothed; scutellum entirely pubescent; elytra with suture narrowly white near base and apex, disc of each with a large, oval spot near suture at end of first quarter; another, slightly larger, adjacent to suture at middle; and a large, subapical spot besides two smaller sublateral spots, alternating with the three larger spots; ventral surfaces largely pubescent, thinly so along middle of sternites and subglabrous along mesepimeral-metepisternal suture, part of metepisternal-metasternal suture, and bases of abdominal segments; antennæ with thin, whitish pubescence on inner sides of first three segments and base of fourth segment, and with short, scattered, black bristles on undersides of first seven segments; pronotum and elytral bases with sparse, erect, black bristles and thin, silvery-black pubescence.

Head hardly broader than prothorax, deeply, and in part closely, punctured, feebly concave at vertex; inferior eye lobes

a little deeper than wide, occupying three-fourths distance between antennal insertions and genal margins. Antennæ one and one-sixth as long as body; scape shorter than third segment and longer than fourth. Prothorax barely longer than broad, slightly swollen before middle, convex, and somewhat deeply and closely punctured on disc. Elytra prominently angulate at humeri; apices truncate, with external and internal angles dentate; surfaces with coarse punctures of different sizes, irregular except at sides.

Length, 13 millimeters; breadth, 4.

Holotype, male, loan deposit, California Academy of Sciences, Ta-hian, foot of Five Finger Mountains, southcentral Hainan, June 18, 1935, taken by the author.

Differs from *G. coomani* Pic in having the prothorax longer, the humeri more prominent, some of the dorsal spots white instead of yellow, the third, and base of fourth, antennal segments clothed with pale pubescence, and in other characters.

Distribution.—Hainan Island.

GLENEA RELICTA Pascoe.

*Glenea relict*a PASCOE, Trans. Ent. Soc. London (2) 4 (1858) 258; BATES, Ann. & Mag. Nat. Hist. (4) 12 (1873) 387; op. cit. (6) 19 (1897) 485; MATSUMURA, Thous. Ins. Japan (609) 3 (1908) pl. 52, fig. 14; Illus. Common. Ins. Japan 3 (1931) 132, pl. 21, fig. 1; MATSUSHITA, Journ. Fac. Agr. Hokkaido Imp. Univ. 34 (1933) 413.

Male.—Head and prothorax black; antennæ castaneous basally and blackish apically; elytra reddish castaneous with apical third blackish; ventral surfaces blackish brown; legs pale castaneous, blackish brown on tarsi; surfaces clothed with silvery-white pubescence as follows: head clothed on genæ, sides and anterior border of frons, and along two stripes on occiput; prothorax with a median discal stripe, two stripes on each side, and part of base, white; elytra with suture, an apical spot, and four small discal spots in a zig-zag arrangement on each; ventral surfaces largely white; antennæ thinly pubescent.

Head broader than prothorax, finely punctured; antennæ nearly one and one-half as long as body. Prothorax fully as long as broad, slightly swollen in middle, closely punctured. Elytra deeply and subseriately punctured on basal two-thirds.

Length, 9.4 to 10 millimeters; breadth, 2.5 to 3.

Female.—Antennæ one and one-fifth as long as body; prothorax hardly as long as broad.

Length, 9.5 to 12 millimeters; breadth, 2.8 to 4.

The Lingnan Natural History Museum has specimens from Cheung-kon-ts'uen, Kiung-shan District, April 4 to 14, Tai-pin-ts'uen, foot of Loi Mother Mountain, April 28 to 30, May 5 to 11, 15 to 18, 21 and 22, and July 20 and 21, Tai-tsing-lam-ts'uen, near Loi Mother Mountain, June 1 to 11, and Nam-liu-tin, Lam-wan-tung, July 29 and 30, 1935, F. K. To. The author collected specimens at Ta-han, near Red Mist Mountain, June 22 to 24, and Tai-pin-ts'uen (Dwa-Bi), July 26, 1935.

New to Hainan.

Distribution.—Japan; Ryu Kyu Islands; Formosa; North China; Kiangsi; Hainan.

GLENEA TONKINEA Aurivillius. Plate 6, fig. 3.

Glenea tonkinea AURIVILLIUS, Arkiv. f. Zoologi 18 A 9 (1926) 19, fig., Tonkin.

Female.—Entirely black, except for reddish trochanters; surfaces marked with silvery, greenish, or bluish-white pubescence: head with two occipital stripes, margins of frons and anterior parts of genæ bluish white, postgenæ silvery, remainder of frons thinly bluish white; antennæ with bluish white on inner sides of first three segments and short dark bristles on undersides of first five; prothorax with a bluish-white stripe along middorsal line, a silvery-white stripe just above middle of each side and sternum and lower parts of sides thinly pubescent; scutellum pale bluish white; elytra faintly silvery gray along apical half, and disc of each with four equally spaced, more or less transverse bands of silvery white, tinged with blue-green: first composed of two spots, second of a transversely oblong bar, third a squarish spot, and last an ill-defined, more bluish apical spot, not separated from suture as are others; ventral surfaces partly clothed with silvery-white pubescence.

Head deeply, somewhat densely punctured. Antennæ one and one-fourth as long as body. Prothorax a little broader than long; disc densely and finely punctured. Elytral surfaces deeply and not very regularly punctured.

Length, 10.5 to 11 millimeters; breadth, 3.4.

Male.—Slenderer; antennæ one and one-third as long as body; femora reddish brown basally.

One female, in the Lingnan Natural History Museum, taken in the vicinity of villages at the foot of Loi Mother Mountain, May 25 to 28, 1935, by F. K. To; 1 male, in the author's collection, Ta-hian, foot of Five Finger Mountains, June 17, 1935,

taken by the author; 2 females, collected at Tai-pin-ts'uen, near Loi Mother Mountain, May 8 to 11, 1935, by F. K. To.

New to Hainan.

Distribution.—Tonkin; Hainan.

Subgenus *STIROGLENIA* Aurivillius

Stirolenea AURIVILLIUS, Arkiv f. Zoologi (13) 9 (1920) 31.

GLENEA (*STIROGLENIA*) CANTOR (Fabricius). Plate 6, fig. 5.

Lamia cantor FABRICIUS, Mant. Ins. 1 (1787) 142, China.

Saperda cantator FABRICIUS, Syst. Eleuth. 2 (1801) 304, emendation.

Glenea cantor GAHAN, Trans. Ent. Soc. London (1894) 488.

Glenea (*Stirolenea*) *cantor* AURIVILLIUS, Arkiv f. Zoologi (13) 9 (1920) 31; GRESSITT, Lingnan Sci. Journ. 18 (1939) 96.

Male.—Black; elytra yellowish testaceous except at humeri and apices; anterior and middle femora and tibiae reddish amber; surfaces in part clothed with pubescence: head, prothorax, and ventral surfaces with dense, creamy pubescence, marked by subglabrous, black areas: a median line on occiput, vertex, and upper part of frons, a stripe behind each upper eye lobe, a median line and four spots on pronotum, and four spots on each side of prothorax, middle of mesepisternum, each end of metepisternum, middle of sides of metasternum, and base of side of each abdominal segment; elytra with thin, golden pubescence, apical fifth with grayish-white except for two transverse black bars on each.

Head nearly impunctate, hardly concave between antennal supports. Antennae one and one-third as long as body; scape barely longer than third segment. Prothorax a little broader than long, constricted near base, sparsely punctulate. Elytra with punctures of various sizes, subseriate basally.

Length, 11 to 13 millimeters; breadth 4 to 4.5.

Female.—Body broader; antennae barely longer than body.

Length, 13.5 to 15 millimeters; breadth, 5 to 6.

The Lingnan Natural History Museum has specimens from Lam-ko, Lin-kao District, May 23 to 25, Nodoa, May 14 to 16, Faan-na, 15 kilometers south of Nodoa, July 14 and 15, Hau-ying-ts'uen, 10 kilometers southeast of Nodoa, July 31, Taai-po, Lin-kao District, about 40 kilometers from Nam-fung, September 19 to 24, 1932, Tai-pin-ts'uen, July 25, Nam-liu-tin, August 1 to 4, and Sam-kwong-ts'uen, August 7 to 11, 1935, taken by F. K. To; Man-fook-chuen, July 12, and Wong-lung-chuen, August 22, 1929, Lingnan Univ. Fifth Hainan Exped. The writer collected specimens at Ta-hian, foot of Five Finger Mountains,

June 11 to 19, and Liamui (Leng-moon), eastern Hainan, August 1, 1935.

New to Hainan.

Distribution.—South China; Hainan; Tonkin.

PHYTÆCIINI

OBERETTÆ Thomson, Syst. Cer. (1864) 119, 399.

PHYTÆCIDES VRAIS Lacordaire, Gen. Col. 9 (1872) 849.

PHYTÆCIINI Aurivillius, Col. Cat. 74 (1923) 513.

Eyes large, finely faceted; prothorax unarmed laterally; anterior coxal cavities angulate externally, generally closed behind; middle coxal cavities open externally to epimera; mesosternal process platelike; metepisternum narrowed posteriorly; tarsal claws appendiculate and divaricate.

Key to the Hainan genera of Phytæciini.

- Form not extremely narrow; elytra distinctly attenuated posteriorly and bearing lateral carinæ and discal costæ, their sides vertically deflexed to near apices..... *Nupserha*.
 Form very narrow; elytra often parallel-sided, lacking distinct costæ, carinæ, or vertically deflexed sides..... *Obera*.

Genus NUPSERHA Thomson

Nupserha THOMSON, Classif. Cer. (1860) 41; Syst. Cer. (1864) 400;
 PASCOE, Trans. Ent. Soc. London (3) 3 (1867) 413; LACORDAIRE,
 Gen. Col. 9 (1872) 854.

Frons subrectangular; vertex nearly plane; eyes finely faceted, emarginate, inferior lobes broader than deep; antennæ stout, about as long as body, scape slightly longer than third segment, fourth and following segments gradually diminishing in length; prothorax no longer than broad, swollen on middle of disc and at middle of each side; scutellum short, truncate; elytra slightly narrowed, each emarginate or truncate apically and costate longitudinally.

Genotype.—*Stibara cosmopolita* Thomson.

Range.—Oriental Region; Japan; North China; Africa.

Key to the Hainan species of Nupserha.

1. Elytra distinctly carinate along top of lateral declivity, emarginate and bidentate apically 2.
 Elytra not distinctly carinate along top of lateral declivity, obliquely truncate apically, without distinct teeth..... 3.
2. Dorsal surfaces of body entirely ochraceous; ventral surfaces largely black; prothorax distinctly swollen at each side..... *corrugata*.
 Head and elytral apices black; ventral surfaces largely testaceous; prothorax feebly swollen laterally..... *fricator*.

3. Elytra nearly parallel-sided, subtransversely truncate apically; prothorax about one and one-third as broad as long; body less than 9 millimeters long *batesi*.
 Elytra distinctly narrowed posteriorly, obliquely truncate apically; prothorax not much broader than long; body more than 10 millimeters long *kankauensis*.

NUPSERHA BATESI Gressitt.

Nupserha batesi GRESSITT, Lingnan Sci. Journ. 16 (1937) 618, southern Kiangsi and eastern Kwangtung; *ibid.* 18 (1939) 98.

Female.—Small, subparallel-sided. Body pale testaceous, more ochraceous on pronotal and elytral discs; head black; antennæ blackish brown basally and apically, middle segments ochraceous brown with duller apices; elytra pitchy brown along sides, behind humeri, on apices, and slightly so on apical portions of discs; tarsi, posterior tibiæ, and apex of last abdominal segments pitchy brown.

Head finely punctured, most closely so on occiput. Antennæ one and one fifth as long as body; scape about as long as third segment; fourth segment equal to third, slightly longer than fifth. Prothorax one and one-third as broad as long, constricted at base, finely and unevenly punctured. Scutellum nearly square. Elytra very slightly narrowed posteriorly; apices subobliquely truncate; surfaces with fairly uniform punctures arranged in six longitudinal rows along central portion of each. Ventral surfaces with a few shallow punctures on sides of metasternum.

Length, 8.5 millimeters; breadth, 2.

A single specimen, in the Lingnan Natural History Museum, taken at Tai-pin-ts'uen, near Loi Mother Mountain, May 1 to 4, 1935, by F. K. To.

New to Hainan. This specimen is not entirely typical, being paler than mainland specimens, and having the prothorax not narrowed apically.

Distribution.—Southern Kiangsi; eastern Kwangtung; Hainan.

NUPSERHA CORRUGATA Gressitt sp. nov. Plate 6, fig. 6.

Male.—Body black, dorsal surfaces, most of head, prosternum, mesosternal intercoxal process, and posterior border of mesepisternum bright reddish orange, more yellowish on elytra and labrum; head and prothorax clothed with golden-orange pubescence, ventral surfaces and legs with pale greenish-golden pubescence; antennæ with sparse, pale, recumbent hairs, and an erect, black fringe on undersides of first six or seven segments;

elytra with sparse, short, suberect, orange hairs; a few dark bristles on head.

Head convex in front, feebly grooved medially, finely and irregularly punctured; inferior eye lobes a little wider than deep. Antennæ barely as long as body, moderately stout, cylindrical; scape slightly broadened apically, a little longer than third segment; third and fourth segment subequal, following segments slightly diminishing in length. Prothorax nearly twice as broad as long, constricted near base and apex, swollen at middle of each side and on disc to near base at midline; surfaces indistinctly punctured. Scutellum subvertical. Elytra about two and one-third times as long as head and prothorax combined, nearly straight-sided, with apex emarginate, bearing a small tooth at suture and an acutely produced tooth externally, disc distinctly tricarinate, with one to three subregular rows of punctures along each interspace. Ventral surfaces finely and sparsely punctured. Posterior tarsi with first segment as long as following two segments combined, fully as long as last segment.

Length, 12 millimeters; breadth, 4.2.

Holotype, male, loan deposit, California Academy of Sciences, Ta-hian, near foot of northwest side of Five Finger Mountains, southcentral Hainan, altitude 600 meters, June 11, 1935, taken by the author.

Differs from *N. fricator* (Dalm.) in being less narrowed posteriorly, with the prothorax shorter, more swollen at sides, the elytra more strongly carinate, the dorsal surfaces entirely yellowish, and the ventral surfaces largely black.

Distribution.—Hainan Island.

NUPSERHA FRICATOR (Dalman). Plate 6, fig. 8.

Saperda fricator DALMAN in Schönherr, Syn. Ins. (1) 3 app. (1817) 183; CASTELNAU, Hist. Nat. Col. 2 (1840) 489.

Nupserha fricator PASCOE, Trans. Ent. Soc. London (3) 3 (1867) 414.

Male.—Body ochraceous; head, antennæ, sides and apices of elytra, and most of last abdominal segment black, elytral suture and punctures pitchy behind middle; body clothed with thin, buffy-golden pubescence.

Head practically as broad as elytral bases, finely punctured, densely so on occiput. Antennæ nearly one and one-half as long as body, tapering; scape barely longer than third segment; fourth and fifth segments subequal, each longer than third. Prothorax practically as long as broad, constricted near base, slightly narrowed towards apex, feebly obtuse at sides, broadest

behind middle; surface convex along middle of disc, with only a few shallow punctures on sides and behind center of disc. Scutellum trapeziform. Elytra strongly narrowed posteriorly; apices emarginate, with both angles produced into acute teeth, outer angles more prominent; surfaces regularly punctured in six rows at middle of each.

Length, 9 to 11 millimeters; breadth, 2 to 2.5.

Female.—Antennæ barely one and one-third as long as body; elytra less strongly narrowed.

Length, 10.5 to 12 millimeters; breadth, 2.5 to 3.3.

About 15 specimens, in the Lingnan Natural History Museum and the author's collection, taken on the island as follows: 1 from Nodoa, April 28, 1932, F. K. To; 1 from Lung-hou-tong, April 22, 1932, W. E. Hoffmann; 2 from Tun-heung-ts'uen, 6 miles southeast of Nodoa, June 13 and 14, 1 from Nam-fung, June 29 to 30, O. K. Lau and F. K. To; 2 from Tai-pin-ts'uen, April 25 and 26 and May 19 and 20, 1935, F. K. To; 1 from Tachian, Five Finger Mountains, June 13, 1 from Ta-hau, west of Nodoa, July 4, a few each from Faan-ta, east of Nam-fung, July 17, and Liamui (Leng-moon), August 1 and 2, 1935, taken by the author.

New to Hainan.

Distribution.—Burma; Hainan; Formosa; Malacca; Java; Borneo; Celebes.

NUPSERHA KANKAUENSIS (Schwarzer) comb. nov. Plate 6, fig. 7.

Oberea marginella var. *kankauensis* SCHWARZER, Ent. Blätter 21 (1925) 153, southern Formosa.

Oberea kankauensis MATSUSHITA, Journ. Fac. Agr. Hokkaido Imp. Univ. 34 (1933) 420.

Female.—Body ochraceous, slightly paler beneath; head, proximal and distal antennal segments, lateral margins of elytra, and apical two-thirds of last abdominal segment black; apices of middle antennal segments, tarsi, and posterior tibiae pitchy black; posterior portions of elytral discs dull brown. Body surfaces clothed with pale-buff pubescence.

Head broader than prothorax, narrower than elytral bases, shallowly punctured on frons, more closely and deeply so on occiput. Antennæ one and one-sixth as long as body; third segment fully as long as scape and fourth segment, longer than fifth. Prothorax distinctly broader than long, slightly constricted at apex and base and broadened behind middle, its surface finely, and in large part closely, punctured. Elytra moderately nar-

rowed, obliquely subemarginate-truncate apically; surfaces of each in large part punctured in six regular rows.

Length, 10 to 12.5 millimeters; breadth, 3 to 3.5.

Male.—Prothorax about as long as broad; elytra more strongly narrowed; antennæ one and one-third as long as body.

Length, 9.5 to 12 millimeters; breadth, 2.5 to 3.

Several specimens, in the Lingnan Natural History Museum and the author's collection, were taken at Man-fook-chuen, near Nodoa, July 4, 1929, Lingnan Univ. Fifth Hainan Exped. Cheung-kon-ts'uen, April 13 and 14, Tai-pin-ts'uen, May 17 to 22, 1935, F. K. To; Ta-hian, Five Finger Mountains, June 11 and 12, 1935, taken by the author; 1 specimen was taken by Whitehead in 1899.

New to Hainan.

Distribution.—Formosa and Hainan.

Genus OBEREA Mulsant

Oberea MULSANT, Col. France Longic. (1839) 192, 194; THOMSON, Classif. Cer. (1860) 41; Syst. Cer. (1864) 400; PASCOE, Trans. Ent. Soc. London (3) 3 (1867) 363, 420; LACORDAIRE, Gen. Col. 9 (1872) 851, 864.

Isoscles NEWMAN, Entomologist 1 (1842) 318; THOMSON, Syst. Cer. (1864) 400; PASCOE, Trans. Ent. Soc. London (3) 3 (1867) 420.

Form slender and elongate, subparallel-sided; head generally broader than prothorax; eyes finely faceted; antennæ slender, about as long as, or slightly longer than, body; prothorax usually subcylindrical; scutellum truncate or emarginate; elytra narrow, several times as long as head and prothorax combined, emarginate or truncate apically; abdomen cylindrical; legs short.

Genotype.—*Cerambyx oculatus* Linnæus.

Range.—Cosmopolitan, except South Seas and South America.

Key to the Hainan species of *Oberea*.

1. Head testaceous 2.
Head, last abdominal segment, and antennæ black..... *nigriceps*.
2. Elytra, metathorax, and abdomen largely testaceous..... 3.
Elytra, metathorax, and abdomen black, form extremely narrow.
nigriventris.
3. Prothorax longer than broad, or subequilateral..... 4.
Prothorax broader than long, vertex sparsely punctured, elytra largely pale *rosi*.
4. Elytra impunctate before apices; abdomen finely and sparsely punctured laterally; antennæ at least one and one-third as long as body in male *formosana*.
Elytra deeply punctured to apices; abdomen densely punctured laterally; antennæ barely longer than body in male..... *fuscipennis*.

OBEREA FORMOSANA Pic.

Oberea formosana PIC, Longic. (8) 1 (1911) 220, Formosa; GRESSITT, Lingnan Sci. Journ. 18 (1939) 102.

Oberea holoxantha var. *formosana* PLAVILSTSHIKOV, Revue Russe d'Ent. 15 (1916) 80; AURIVILLIUS, Col. Cat. 74 (1923) 532.

Male.—Elongate, somewhat narrowed behind shoulders. Body pale ochraceous, slightly duller, with golden-buff pubescence on elytral discs; sides and apices of elytra slightly pitchy; antennæ black on first two segments, pitchy black to dull brown on remainder; eyes black; last abdominal segment tipped with black.

Head as broad as elytral bases; surface with fine, fairly close punctures. Antennæ one and one-half as long as body; scape not quite as long as third segment; fourth segment longer than third, subequal to fifth, sixth, and seventh segments. Prothorax a little longer than broad, slightly convex at sides and on discs; surfaces irregularly punctured near apex, behind middle of disc and on sides. Scutellum emarginate. Elytra long, narrowed behind shoulders, obliquely emarginate apically, with both angles acute; surfaces of each regularly punctured in six rows to near apex. Sides of abdomen sparsely punctured; last abdominal sternite shallowly concave apically.

Length, 12 to 17 millimeters; breadth, 1.7 to 2.8.

Female.—Antennæ barely longer than body; elytra less narrowed behind humeri.

Length, 13 to 16 millimeters; breadth, 2 to 2.8.

Numerous specimens, in the Lingnan Natural History Museum, California Academy of Sciences, and the author's collection, collected at Kachek, May 13 to 19, Nam-fung, July 2, 1932, F. K. To; "Hainan Id.", April 30, 1932, W. E. Hoffmann; Cheung-kon-ts'uen, April 11 to 14, Tai-pin-ts'uen, April 28 to May 20, Tai-tsing-lam-ts'uen, June 3 to 22, Ying-ko-au, June 23 to 24, Sam-ts'uen-kai-hui, June 27 to July 3, Nam-liu-ting, August 1 and 2, Sam-kwong-ts'uen, August 10 and 11, Nam-po-ts'uen, August 24 to 26, 1935, F. K. To; Chung-kon-ts'uen, July 19, 1935, and other localities, taken by the author.

New to Hainan.

Distribution.—Formosa; Kiangsi; Kwangtung; Hainan.

OBEREA FUSCIPENNIS Chevrolat. Plate 6, fig. 19.

Oberea fuscipennis CHEVROLAT, Revue Zool. (2) 4 (1852) 419, Shanghai, SCHWARZER, Ent. Blätter 21 (1925) 153; MATSUSHITA, Journ. Fac. Agr. Hokkaido Imp. Univ. 34 (1933) 417, 419.

Oberea fulveola BATES, Ann. & Mag. Nat. Hist. (4) 12 (1873) 390, Japan.

Male.—Elongate and narrow, subparallel. Body reddish testaceous; elytra ochraceous, tipped with pitchy; antennæ black proximally and pitchy distally, middle segments reddish brown tipped with blackish.

Head as broad as elytral bases, convex anteriorly, grooved on vertex, closely and finely punctured. Antennæ barely longer than body; third segment considerably longer than scape, slightly longer than fourth and following segments. Prothorax nearly one and one-half as long as broad, slightly constricted at or near apex and base; surface slightly raised along median line and transversely wrinkled on each side of it, irregularly punctured over most of surface. Scutellum truncate apically. Elytra elongate, slightly narrowed behind humeri, obliquely emarginate-truncate and bidentate apically; surfaces heavily punctured to apices. Abdomen closely punctured at sides, sparsely so beneath; last sternite deeply excavated and emarginate apically.

Length, 14 to 18 millimeters; breadth, 1.7 to 2.5.

Female.—Antennæ about as long as body. Last abdominal sternite grooved medially, slightly concave preapically.

Length, 11.5 to 17 millimeters; breadth, 1.5 to 2.3.

A large number of specimens, in the Lingnan Natural History Museum, the British Museum, the California Academy of Sciences, the Musée Heude, and the author's collection, taken at You-boi, June 6, at Man-grin, June 11, 1904, and at Nodoa, April 26, 1932, F. K. To; "Hainan Is.," April 30, 1932, W. E. Hoffmann; Kachek, May 1 to 16, Lam-ko, Lin-kao District, May 23 to 25, 1932, F. K. To; Naam-fung, July 3 to 6, Tun-heung-ts'uen, near Nodoa, June 13 and 14, Lok-kei, near Nodoa, June 20 and 21, 1932, O. K. Lau and F. K. To; Naam-fung, July 7, Yau-ma-woh, near Nodoa, July 8 and 9, Nai-suen, southeast of Naam-fung, August 31, 1932, Cheung-kon-ts'uen, April 13 and 14, Tai-pin-ts'uen, April 25 to May 22 and July 24, vicinity of villages at foot of Lai-mo-ling (Loi Mother Mountain), May 25 to 28, Tai-tsing-lam-ts'uen, June 1 to 12, San-ts'uen-kai-hui, July 1 to 6, Ying-ko-au, near Lai-mo-ling, June 25 and 26, and Sam-kwong-ts'uen, August 7 to 9, 1935, F. K. To; Ta-hian, near Five Finger Mountains, June 17, 1935, taken by the author.

Distribution.—East China; Japan; Formosa; Hainan.

OBBEREA NIGRICEPS (White). Plate 6, fig. 12.

Saperda (Isoscelis) nigriceps WHITE, Ann. & Mag. Nat. Hist. 14 (1844) 425, Hongkong.

Obbera nigriceps FAIRMAIRE, Ann. Soc. Ent. Belg. 39 (1895) 189, 190; KANO, Kontyu 6 (1933) 288; GRESSITT, Lingnan Sci. Journ. 18 (1939) 105.

Female.—Largely reddish testaceous; head black, except neck and base of clypeus; antennæ entirely black; elytra burnt ochraceous, lighter basally, brownish black towards apices and on posterior half of external margin; last abdominal segment black except at extreme base; tarsi and apical portion of hind tibiæ brown to black. Body clothed with fine, pale-golden pubescence, dark on head and last abdominal segment; some erect, golden hairs on pronotum and basal half of elytra; antennæ sparsely ciliated beneath.

Head fully as broad as prothorax, moderately swollen anteriorly, feebly depressed between antennal insertions; surface moderately punctured; frons rectangular. Antennæ five-sixths as long as body; scape slightly shorter than third segment following segments gradually decreasing. Prothorax broader than long, slightly narrower at apex, swollen behind middle at each side and constricted before base; disc moderately raised; surface with fairly dense, heavy punctures. Scutellum squarish, subemarginate-truncate. Elytra three times as long as head and prothorax combined, narrowed behind shoulders; apices obliquely emarginate-truncate, with each angle briefly toothed; surface very heavily punctured in six longitudinal rows, the punctures mostly larger than spaces between them. Sides of metathorax and abdominal segments densely punctured.

Length, 15 to 17.5 millimeters; breadth, 3 to 3.5.

Male.—Narrower; antennæ as long as body; prothorax as long as broad.

Length, 15.5 millimeters; breadth, 2.8.

Specimens in the Lingnan Natural History Museum, the United States National Museum, and the author's collection, from Tai-pin-ts'uen, near Loi Mother Mountain, April 20 to May 22, Cheung-kon-ts'uen, April 1 to 9, 1935, F. K. To; Nododa, May 30, 1935, taken by the author.

Some specimens have the prothorax and elytra rather pale, and the one from Nododa has the antennæ ochraceous beyond the middle of the fourth segment.

New to Hainan Island.

Distribution.;—Hongkong; Formosa; Hainan.

OBEREA NIGRIVENTRIS Bates. Plate 6, fig. 9.

Oberea nigriventris BATES, Ann. & Mag. Nat. Hist. (4) 12 (1873) 390, Japan; MATSUSHITA, Journ. Fac. Agr. Hokkaido Imp. Univ. 34 (1933) 418, 419, 422; GRESSITT, Lingnan Sci. Journ. 18 (1939) 105.

Male.—Extremely elongate and narrow, laterally compressed; head, pro- and mesothorax, forelegs, and middle and hind femora reddish testaceous; antennæ, metathorax, abdomen, and hind tibiæ black; tarsi dull brown; elytra reddish at extreme base, disc dull reddish brown, remainder black. Body clothed with very fine, golden pubescence; only a few short, erect hairs.

Head broader than prothorax, strongly swollen laterally and anteriorly, concave on vertex, finely sulcate on occiput; surface with moderately dense and fine punctures, subvermiculose on occiput; frons higher than wide. Antennæ one and one-fifth as long as body; third segment slightly longer than scape, subequal to following segment. Prothorax cylindrical, one and one-half as long as broad; disc feebly swollen; surface finely punctured. Scutellum longer than broad, narrowed and truncate apically. Elytra narrow, closely punctured in six rows; apices obliquely truncate and toothed at each angle. Sides of metathorax and abdomen densely punctured; last abdominal sternite shallowly concave to base.

Length, 12 to 15 millimeters; breadth, 1.2 to 1.5.

Female.—Antennæ slightly exceeding elytral apices. Last abdominal sternite hardly concave, finely grooved.

Length, 12.5 to 17 millimeters; breadth, 1.5 to 2.2.

Several specimens, in the Lingnan Natural History Museum and the author's collections taken at Hoihow, Hainan, April 18, 1932, by F. K. To; south of Nodoa, July 13, 1929, Lingnan Univ. Fifth Hainan Exped., Cheung-kon-ts'uen, April 13 and 14, Tai-pin-ts'uen, May 15 and 16, 1935, F. K. To; Ta-hian, June 12, 1935, taken by the author.

New to Hainan.

Distribution.—Japan; Formosa; East and South China; Hainan.

OBEREA ROSI Gressitt sp. nov. Plate 6, fig. 11.

Female.—Elongate; prothorax short; elytra narrow, slightly constricted behind base. Body testaceous; antennæ black on first three and one-half segments, last and intervening segments reddish brown; elytra subochraceous, dusky at extreme apices and impressed with dark resin-colored punctures; head, prothorax, and legs paler than elytra and abdomen, extreme apex of last segment of latter black. Surfaces clothed with fine golden pubescence; a few erect, golden hairs on sides of head and basal portions of pronotum and elytra.

Head transverse, broader than prothorax, as broad as elytra, slightly concave between antennal insertions, feebly swollen anteriorly; surface finely punctured; eyes mediocre, separated in front by nearly twice width of a ventral lobe; frons broader than high; genæ large, prominent. Antennæ not quite reaching elytral apices; scape shorter than fourth segment; fourth segment shorter than third. Prothorax slightly broader than long, cylindrical, slightly constricted before basal margin, very slightly swollen above and at sides, with moderately sparse and fine punctures. Scutellum short, narrowed, subsinuate-truncate apically. Elytra attenuate, three and one-half times as long as head and prothorax combined, narrowed beyond base and slightly expanded before apex; apices narrowed, obliquely truncate, sutural angles produced; surfaces with large, deep punctures, those of outermost row less than one, and those of inner rows one to two, puncture widths apart. Sides of metasternum vertical, heavily punctured, as are metepisterna and sides of abdominal segments. Posterior femora not quite reaching apex of second abdominal segment; posterior tarsi more than half as long as tibiae.

Length, 14.2 to 18 millimeters; breadth, 2.5 to 3.2.

Male.—Antennæ about as long as body; elytra more narrowed posteriorly.

Length, 15 millimeters; breadth, 2.7.

Holotype, female, in the Musée Heude, Shuiman, Hainan Island, April 17, 1936, collected by Commander G. Ros, for whom the species is respectfully named; allotype, male, in the Lingnan Natural History Museum, Lok-kei, northwest of Nodoa, Hainan, June 20 and 21, 1932, O. K. Lau and F. K. To; four female paratypes, in the Lingnan Natural History Museum, the United States National Museum, and the author's collection, Naam-fung, south of Nodoa, Hainan, June 27 and 28, 1932, O. K. Lau and F. K. To; Tai-pin-ts'uen, near Loi Mother Mountain, Hainan, April 25 to May 11, 1935, F. K. To.

Differs from *O. holoxantha* Fairmaire in having the head more sparsely punctured, the prothorax shorter and more cylindrical, the elytra more densely punctured, and the femora shorter. Differs from *O. formosana* Pic in having the head broader, the antennæ paler, the prothorax much shorter, the sides of the metathorax more heavily punctured, the elytra broader, and in other characters.

Distribution.—Hainan Island.

TETRAOPINI

TETRAOPHTHALMITÆ Blanchard, Hist. Nat. Ins. (1845) 160.

TETRAOPESITÆ Thomson, Classif. Cer. (1860) 66.

ASTHATITÆ Thomson, Syst. Cer. (1864) 117, 399.

ASTATHEINÆ Pascoe, Trans. Ent. Soc. London (3) 3 (1867) 347.

TETRAOPIDES Lacordaire, Gen. Col. 9 (1872) 849, 871.

TETRAOPINI Casey, Mem. Col. 4 (1913) 373; Aurivillius, Col. Cat. 74 (1923) 570.

Body relatively broad, depressed, more or less oblong; head broad; antennal insertions distant; vertex subhorizontal; eyes finely faceted, separated into two distant lobes; antennæ stout, rarely much longer than body; prothorax swollen, but not toothed, laterally; elytra noncarinate; mesosternal process unarmed; middle coxal cavities open externally to epimera; tarsal claws appendiculate, divaricate.

Key to the Hainan genera of Tetraopini.

1. Metasternum with an anteriorly projecting process between middle coxæ.
2.
Metasternum lacking an anteriorly projecting process between middle coxæ; mesosternal intercoxal process long and narrow..... 3.
2. Metasternal intercoxal process extending forward and overlapping apex of mesosternal process, which is subvertical..... *Astathes*.
Metasternal intercoxal process meeting mesosternal process at about middle of coxæ, and entering its angular emargination.... *Anastathes*.
3. Antennæ generally shorter than body; head lacking lateral fringes of hair in male *Chreonoma*.
Antennæ longer than body in both sexes; head with prominent lateral fringes of hair in male..... *Lasiophrys*.

Genus ASTATHES Newman

Astathes NEWMAN, Entomologist 1 (1842) 299; THOMSON, Classif. Cer. (1860) 42; Syst. Cer. (1864) 399; PASCOE, Trans. Ent. Soc. London (3) 3 (1867) 348; LACORDAIRE, Gen. Col. 9 (1872) 872, 873; GAHAN, Trans. Ent. Soc. London (1901) 38.

Tetraophtthalme BLANCHARD, Hist. Nat. Ins. 2 (1845) 161.

Tetraophtthalmus GUERIN, Icon. Regne Anim. Ins. (1844) 244; THOMSON, Archives Ent. 1 (1857) 48.

Body broad and oblong; head fully as wide as prothorax; frons convex; prothorax transverse, swollen on center of disc and at middle of each side; elytra broadly rounded apically; intercoxal process of mesosternum nearly vertical, overhung posteriorly by an anterior process of metasternum; middle tibiæ each with a feeble, oblique groove near apex.

Genotype.—*Astathes perplexa* Newman.

Range.—Oriental Region; Wallacea.

ASTATHES CYANOPTERA Gahan. Plate 6, fig. 14.

Astathes cyanoptera GAHAN, Ann. & Mag. Nat. Hist. (7) 5 (1900) 353, Hainan Island; Trans. Ent. Soc. London (1901) 44.

Male.—Body ochraceous, slightly reddish on head and pronotum; eyes, proximal two and one-half and distal five and one-half antennal segments, tarsi, and distal two-thirds of tibiae black; elytra dark metallic green or steel-blue tinged with purplish. Body covered with sparse, suberect hairs, pale on most surfaces, dark on elytra except apices.

Head irregularly punctured, most densely so on frons. Antennae barely longer than body; scape hardly as long as third segment, longer than fourth. Prothorax about twice as broad as long, constricted near base, strongly swollen on each side and on center of disc; latter sparsely punctate. Elytra less than twice as long as broad; surfaces with punctures of various sizes, partly arranged in longitudinal rows. Ventral surfaces finely punctured.

Length, 11.5 to 13 millimeters; breadth, 4.5 to 5.2.

Female.—Antennae four-fifths as long as body; last abdominal segment concave apically and densely punctured.

Length, 13.5 to 16 millimeters; breadth, 5 to 5.8.

Several specimens, in the Lingnan Natural History Museum and the author's collection, taken at Man-fook-chuen and a groove near Nodoa, July 4, 1929, Lingnan Fifth Hainan Exped.; "Hainan Is.," April 28 and 29, 1932, W. E. Hoffmann; Taai-chau Island (Tin-hosa), off east coast of Hainan, June 2, 1932, W. E. Hoffmann and O. K. Lau; Nam-po-hui, May 27 and 28, Naam-fung, June 24 and 25, O. K. Lau and F. K. To; Tai-pin-ts'uen, May 29 to 31, and Sam-kwong-ts'uen, August 16 to 18, 1935, F. K. To; Ta-hian, June 16 to 18, Ta-han, June 22, and Nodoa, June 29, 1935, taken by the author. Type in the British Museum.

Distribution.—Hainan Island.

Genus ANASTATHES Gahan

Anastathes GAHAN, Trans. Ent. Soc. London (1901) 60.

Form stout, subrectangular; head broader than prothorax; antennae thick and short, third segment no longer than scape; prothorax strongly swollen above and at sides; elytra broad, parallel-sided; metasternum produced anteriorly to about middle of space between middle coxae, entering angulate posterior emargination of mesosternal intercoxal process, which is almost vertical.

Genotype.—*Astathes nigricornis* Thomson.

Range.—Eastern part of Oriental Region.

ANASTATHES ROBUSTA Gressitt sp. nov.

Male.—Broad, oblong, compressed dorsally. Body reddish ochraceous, paler yellowish testaceous on elytra and legs; antennæ brownish black, somewhat reddish on first three segments; eyes, ends of mandibles, and hind wings black; tarsal claws reddish. Body surfaces clothed with suberect, golden-orange hairs, and thin silvery or pale-golden pubescence on head, prothorax, ventral surfaces, and legs, densest on ventral surfaces and front of head; antennæ with oblique, black hairs on first three segments, and thin, adpressed, palish hairs on remainder, undersides fringed with long, suberect, reddish-black hairs beneath for entire length.

Head a little broader than prothorax, hardly concave at middle of vertex; frons convex, slightly depressed along midline, rather closely punctured; occiput, vertex, and genæ sparsely punctured. Antennæ stout, not quite as long as body; scape deeply punctured, fully as long as third segment; fourth segment nearly as long as third, longer than fifth; following segments gradually decreasing in length; last segment with a slender, resin-colored, apical projection. Prothorax nearly twice as broad as long, swollen at middle of each side, constricted behind swelling and laterally before swelling and at apex; disc swollen, deeply punctured except on each side of swelling. Scutellum small, subvertical, rounded-truncate posteriorly. Elytra parallel-sided, broadly rounded apically; surfaces with two feebly raised lines and a few regular longitudinal rows of punctures along inner half of each, irregularly punctured on outer portions, punctures feeble apically. Ventral surfaces finely punctured on sides of thorax and abdomen.

Length, 9.5 millimeters; breadth, 3.55.

Female.—Antennæ three-fourths as long as body; last abdominal sternite large, grooved medially and concave preapically.

Length, 11.5 millimeters; breadth, 4.6.

Holotype, male, in the Lingnan Natural History Museum, Chung-kon-ts'uen, Ka-luk-kong, 18 miles east of Naam-fung, Kiung-shan District, central Hainan Island, March 27 and 28, 1935, F. K. To; allotopotype, female, in the author's collection, and paratopotype, male, in the United States National History Museum, same data.

Differs from *A. biplagiata* Gahan of Siam in having the elytra entirely testaceous, and in other respects. Differs from *A. parva* Gressitt of Formosa in being much stouter, with the antennæ thicker, the prothorax more swollen and more heavily punctured, and in other characters.

Distribution.—Hainan Island.

Genus CHREONOMA Pascoe

Chreonoma PASCOE, Trans. Ent. Soc. London (3) 3 (1867) 348; LA-CORDAIRE, Gen. Col. 9 (1872) 872, 876; GAHAN, Trans. Ent. Soc. London (1901) 63.

Moderately broad, subparallel; head broader than prothorax; frons transverse, strongly convex; inferior eye lobes a little wider than deep; prothorax transverse, swollen at middle of each side and on disc; elytra conjointly rounded; intercoxal process of mesosternum narrow, gradually declivitous anteriorly; middle tibiæ obliquely emarginate externally, tarsal claws toothed beneath at base.

Genotype.—*Chreonoma venusta* Pascoe.

Range.—Oriental Region; Japan and North China.

Key to the Hainan species of *Chreonoma*.

1. Elytra partly or largely steel-blue or greenish..... 2.
Elytra entirely testaceous 3.
2. Elytra blue or greenish except for extreme basal margin; antennæ testaceous except near apices; vertex slightly concave; elytra not very densely punctured *basalis*.
Elytra metallic on apical half, testaceous basally; vertex horizontal; elytra densely punctured basally *cyaneopicalis dimidiata*.
3. Antennæ almost entirely black; pronotum densely punctured; elytra subregularly punctured *atricornis*.
Antennæ pale, dusky at distal ends; pronotum sparsely punctured; elytra irregularly punctured *pallidicolor*.

CHREONOMA ATRICORNIS Pic.

Chreonoma atricornis PIC, Mel. Exot. Ent. 37 (1922) 15, Tonkin.

Female.—Relatively long, dorsoventrally compressed. Body orange-testaceous, slightly duller on ventral surfaces, dusky on tibiæ; eyes, tips of mandibles, and antennæ black, the latter slightly pitchy brown beyond middle. Surfaces with short, sub-erect, or oblique hairs, goldish above and whitish buff on ventral surfaces.

Head distinctly broader than prothorax, slightly grooved on vertex; punctures dense on frons and sparse on occiput. Antennæ not quite as long as body; scape subequal in length to third

segment; fourth to eighth segments successively decreasing in length. Prothorax one and one-half as broad as long, feebly swollen above and at sides; punctures large, moderately close. Scutellum short, rounded-truncate behind. Elytra a little more than twice as long as head and prothorax combined, with moderately close, subregular punctures on basal four-fifths. Ventral surfaces feebly punctured.

Length, 11.5 millimeters; breadth, 3.7.

A single female, in the Lingnan Natural History Museum, taken at Tai-pin-ts'uen, near Loi Mother Mountain, central Hainan, May 1 to 4, 1935.

New to Hainan.

Distribution.—Tonkin; Hainan.

CHREONOMA BASALIS Gahan.

Chreonoma basalis GAHAN, Trans. Ent. Soc. London (1894) 487, Hongkong; GRESSITT, Lingnan Sci. Journ. 18 (1939) 111, 112.

Female.—Relatively long, subparallel-sided. Body pale ochraceous, slightly reddish on pronotum; elytra steel-blue with purplish tinges, except for a narrow basal band and the suture a short distance behind scutellum; antennæ pitchy black on about the last four segments.

Head distinctly broader than prothorax, smooth and sparsely punctured. Antennæ five-sixths as long as body; scape not quite as long as third segment, longer than fourth. Prothorax one and one-half as broad as long, gradually convex and irregularly punctured. Elytra with fairly dense, suberect, dark hairs, irregularly punctured, somewhat densely so at sides and impunctate near apices.

Length, 12.5 millimeters; breadth, 4.

A single female specimen, in the Lingnan Natural History Museum, taken at Tai-pin-ts'uen, near Loi Mother Mountain, Hainan, May 10 and 11, 1935, by F. K. To.

New to Hainan Island.

Distribution.—Hongkong; Kwangtung; Hainan.

CHREONOMA CYANEOAPICALIS²¹ DIMIDIATA Gressitt subsp. nov.

Male.—Relatively narrow, parallel-sided; head very broad. Body ochraceous, apical half of elytra metallic steel-blue, tinged with purplish and green; antennæ reddish ochraceous on basal four or five segments, pitchy black on remainder; legs testaceous.

²¹ *Chreonoma cyaneoapicalis* Gressitt, Lingnan Sci. Journ. 18 (1939) 112, pl. 2, fig. 11, northern Kwangtung.

Body and undersides of antennæ clothed with erect, golden-brown hairs, dark purplish brown on metallic portions of elytra and dull brown on distal halves of antennæ; head, prothorax, and ventral surfaces with thin golden pubescence; dark parts of antennæ with blackish pubescence.

Head distinctly broader than prothorax, as broad as elytra; eyes prominent, inferior lobes barely wider than deep, occupying three-fifths space between antennal supports and genal margins; frons transverse, broader above, finely punctured; vertex horizontal; occiput sparsely but deeply punctured. Antennæ barely longer than body, not very stout; scape subcylindrical, irregularly punctured, as long as third segment; fourth segment a little shorter than third and longer than fifth. Prothorax one and one-fourth as broad as long, swollen at middle of each side, constricted behind swelling; disc strongly swollen, particularly behind center, grossly punctured, except along median line and on each side of swelling. Scutellum broad, very short. Elytra parallel, broadly rounded posteriorly; surfaces even, in large part seriate-punctate; punctures deep basally and minute apically. Ventral surfaces finely and sparsely punctured at sides. Posterior tarsi one-half as long as respective tibiae.

Length, 6.6 millimeters; breadth, 2.25.

Holotype, male, in the Lingnan Natural History Museum, Tai-tsing-Lam-ts'uen, back of Lai-mo-ling (Loi Mother Mountain), central Hainan, June 3 and 4, 1935, F. K. To.

Differs from *C. cyaneoapicalis* Gressitt, of Kwangtung, in being narrower and more reddish, with the head broader, the occiput more sparsely punctured, the antennæ darker, the elytra metallic on apical halves and a little less regularly punctured, and in other characters.

Distribution.—Hainan Island.

CHREONOMA PALLIDICOLOR Pic.

Chreonoma pallidicolor PIC, Mel. Exot. Ent. 17 (1916) 6, Saigon.

Female.—Broad, abbreviated, subrectangular. Almost entirely pale testaceous, slightly orange on head, pronotum, and basal antennal segments; eyes and tips of mandibles black; last few antennal segments pitchy. Body with sparse, erect pale hairs, longer on dorsal surfaces.

Head nearly as broad as elytral bases; frons feebly swollen, sparsely punctured; occiput nearly impunctate. Antennæ not quite as long as body, relatively slender; scape subequal to third segment in length; fourth segment two-thirds as long as fifth

segment, one-half as long as third. Prothorax nearly twice as broad as long, moderately swollen above and at sides, deeply but sparsely punctured, constricted anterior to base. Scutellum short, emarginate-truncate. Elytra broad, closely and subregularly punctured on basal half, remainder with close reticulations in derm resembling punctures.

Length, 8.3 millimeters; breadth, 3.5.

A single female, in the Lingnan Natural History Museum, taken at Tai-tsing-lam-ts'uen, back of Lai-mo-ling (Loi Mother Mountain), central Hainan, June 17 and 18, 1935, by F. K. To.

New to Hainan.

Distribution.—Cochin-China; Hainan.

Genus LASIOPHRYS Gahan

Lasiophrys GAHAN, Trans. Ent. Soc. London (1901) 71.

Moderately narrow, subparallel-sided. Head of male with a distinct lateral fringe of pale hairs on each side between inferior eye lobe and antennal support; antennæ longer than body in both sexes; prothorax broader than long, not greatly swollen; elytra parallel, conjointly rounded apically; mesosternal intercoxal process narrow, subhorizontal, and extending posteriorly to near hind margins of coxal cavities.

Genotype.—*Lasiophrys latifrons* Gahan.

Range.—Indo-Chinese subregion.

LASIOPHRYS TINHOSENSIS Gressitt sp. nov. Plate 6, fig. 13.

Male.—Orange testaceous, slightly dusky beneath; eyes, tips of mandibles, antennæ, and apical quarter of elytra black. Pale surfaces clothed with suberect, golden and buff hairs; antennæ with dense, short, oblique, black hairs and long flying hairs internally; sides of head with projecting fringes.

Head a little broader than prothorax, nearly plane in front; occiput densely, and frons sparsely, punctured; inferior eye lobes ovate, suboblique. Antennæ one and one-half as long as body, gradually tapering; scape a little longer than third segment, not quite reaching to base of prothorax; third segment barely longer than fourth; sixth and following segments much shorter than fifth. Prothorax nearly two and two-thirds as broad as long, slightly swollen at sides, hardly swollen above, constricted anterior to base; disc rather closely punctured, sides sparsely punctured. Scutellum subtriangular. Elytra parallel, deeply subseriate-punctate on basal two-thirds, nearly impunctate apically, Ventral surfaces nearly impunctate.

Length, 10.2 millimeters; breadth, 3.4.

Female.—Head lacking prominent lateral fringes; antennæ slightly longer than body.

Length, 10.8 millimeters; breadth, 3.6 to 4.

Holotype, male, in the Lingnan Natural History Museum, Taai-chau Island (Tinhosa), Wan-ning District, off coast of Hainan, June 2, 1932, W. E. Hoffmann and O. K. Lau; allotype, female, in the author's collection, and paratype, female, in the United States National Museum, same data.

Differs from *L. longicornis* Pic, of Cochin-China, in having the antennæ much less than twice as long as body, the pronotal disc more closely punctured, and in other characters. Differently colored, and slenderer than *L. latifrons* Gahan.

Distribution.—Tinhosa, Taai-chau Island, off Hainan.

HAINAN LOCALITIES AT WHICH LONGICORNS WERE COLLECTED ²²

The present list has the purpose of making possible the more or less exact location of all localities mentioned in the text, as far as they are known to the author. Few maps of Hainan have been published, and only a small proportion of the place names used in this work are to be found on any of them. Furthermore, on the various existing maps, and in works dealing with the natural history of the island, frequently romanizations of place names are used only from a single dialect, such as Hainanese, Cantonese, or Mandarin, which are often unrecognizable to people unfamiliar with the various dialects and with the Chinese characters or the meanings of the place names, so that the identification of localities is confusing or impossible. Even in the present work, several place names have remained unidentified, and for others only one or two romanizations are available.

In this list all the place names used in this work are arranged alphabetically. The spellings used are those that occur on the actual labels of the specimens studied. The explanations—location in respect to a key locality, approximate (often roughly estimated) altitude, and the Chinese characters—are given after the Hainanese ("native" Chinese, not aboriginal) or English

²² Plate 8 shows a map of the key localities of Hainan, mountain ranges, and rivers. The boundaries of the thirteen districts are not shown because of their periodic change and indefiniteness in the central part where most of the collecting stations occur. However, the district cities, or capitals of the various districts (all of them but one—Deng-ag or Ting-on—being on or near the coast) are designated, even though most of them do not represent places of origin of longicorn specimens.

spellings, in most cases, with other romanizations following. The names taken from Lingnan Natural History Museum labels, or from McClure's papers, are mostly romanized according to accepted custom, but some of the author's own romanizations are purely according to sound, as are some on Miss Moninger's map in "The Isle of Palms." The principal difference is that, according to customs, *p* is used for *b*, and *ph* ("aspirated") for *p*, as well as *t* for *d*, and *th* for *t*.

The following symbols, placed after the romanizations, are used to designate the dialect or origin of the name, as far as it is known to the author:

† HAINANESE. Largely from Miss Moninger's map in "The Isle of Palms." A few from the British Admiralty map.

‡ ROMANIZATIONS on the author's specimen labels, largely published in "Notes on collecting in Hainan . . .", a few original in this work. Mostly Hainanese, but a few Hakka or Cantonese.

* CANTONESE (Dialect of Canton, provincial Chinese capital during the period when most of the material was collected) as mostly taken from the Lingnan Natural History Museum labels and McClure's papers.

✧ MANDARIN (Official Chinese dialect; Pekinese). Partly from Ros's labels.

◇ LOI (Principal interior group of aborigines).

‖ FROM specimen labels in the British Museum, probably Hainanese or Loi.

LIST OF PLACES

CH'ENG-MAI. *See* Dio-vai.

CHEUNG-KON-TS'UEN * [長幹村]. Chung Kon. Village southeast of Nodoa, on Deng-an River. Altitude 270 meters.

CHICHERIANG.‖ Location unknown.

CH'ING-MAAI. *See* Dio-vai.

CHUE-MO-LING * [猪毛嶺]. Hill northeast of Nodoa. Altitude 300 meters (?)

CHUNG-KON. *See* Cheung-kon-ts'uen.

CHUNG-MAI. *See* Dio-vai.

CHUNG-MEI ✧ [中尾]. Locality 24 kilometers southeast of Nam-fung. Altitude 250 meters.

DENG-AN † [安定]. Ting-on,* Ting-an,✧ Deng-ag.† District city in northeastern Hainan, south of K'ung-chow. Altitude about 80 meters.

DIO-VAI † [澄邁]. Ch'eng-mai,✧ Ching-mai,* Chung-mai. District city on north coast, west of Hoihow. Near sea level.

DOVE MOUNTAIN ‡ [沙帽嶺]. Sha-po-ling,* Sa-mo-leng,* Sha-po-shan,✧ Sa-ko-lia,‡ Twa-po-lia.‡ Mountain southwest of Nodoa and near Nam-fung. Altitude 795 meters.

- DWA-BI ‡ [大邊村]. Tai-pin-ts'uen,* Tai-pin. Village just north of Loi Mother Mountain, central Hainan. Altitude 400 meters.
- FAAN-MAAN-TS'UEN * [番萬村]. Faan-maan. Village in southern Hainan, northwest of Po-ting, and considerably north of Sam-a. Altitude about 150 meters.
- FAAN-NA * [番雅]. Place about 15 kilometers south of Nodoa, near Nam-fung, northcentral Hainan. Altitude about 160 meters.
- FAAN-TA. See Fan-ta.
- FAN-HEANG. See Fan-hiang.
- FAN-HIANG ‡ [番鄉]. Fan-heang, ‡ Fang-shlagt? Village in central Hainan, northeast of Five Finger Mountains. Altitude about 500 meters.
- FAN-JANG. See Fan-ziang.
- FAN-TA ‡ [番打]. Faan-ta,* Fang-ta. † Village in northcentral Hainan, a days' walk south of Nam-fung. Altitude about 250 meters.
- FAN-ZIANG. ‡ Fan-jang. † Village several kilometers westsouthwest of Fan-hiang, central Hainan. Altitude about 450 meters.
- FANG-NO * [番那]. Village eastsoutheast of Nam-fung, northcentral part. Altitude about 225 meters.
- FANG-TA. See Fan-ta.
- FIVE FINGER MOUNTAINS [五指嶺]. Ngau-chi-lia, ‡ Ng-tze-leng,* Wu-chih-shan,* Mount Wuchi. † Highest range on Hainan, a little south of the center of the island. Summit 1,890 meters.
- FOOI-IU.* Place a few kilometers northwest of Nodoa. Altitude 250 meters.
- HAU-YING-TS'UEN * [後影村]. Hau-ying. Village near Lin-fa-shan, east of Nodoa. Altitude 205 meters.
- HOI-HOW [海口]. Hai-ho, † Hai-kau.* Port at northern end of Hainan, sea level.
- HUMMOCKS [火山]. Hoi-toa, ‡ Foh San.* Extinct volcanoes westsouthwest of Hoi-how. Altitude about 250 meters.
- KA-CHEK † [嘉積]. Ka-tsek. City near coast in eastcentral Hainan. Altitude about 30 meters.
- K'IUNG-CHOW † [瓊州] K'iung-chow-fu. Capital of Hainan, a few kilometers south of Hoihow. Altitude about 45 meters.
- KUEN-YAN-NGAN * [觀音巖]. Koon-yam-ngaam.* Near Lin-fa-shan, east of Nodoa. Altitude 200 meters.
- LAI-MO-LENG. See Loi Mother Mountain.
- LAI-MO-LING. See Loi Mother Mountain.
- LAM-KO. See Lim-ko.
- LIA-MUI † [嶺門]. Leng-moon.* Town in eastcentral Hainan, east of Loi Mother Mountain. Altitude about 375 meters.
- LIM-KO † [臨高]. Lam-ko,* Lin-kao.* District city in northern Hainan, near coast.
- LIN-FA-SHAN * [蓮花山]. Lin-fa-ling,* Lin-fa-leng.* Mountain east of Nodoa, northcentral Hainan. Altitude 600 meters.
- LIN-KAO. See Lim-ko.
- LOH-FUNG-TUNG.* Place in Yai District, southern Hainan.

LOH-MA-CHUEN * [羅馬村]. Southwest of Nodoo. Altitude 180 meters.

LOI-MAI-LIA. See Loi Mother Mountain.

LOI MOTHER MOUNTAIN [黎母嶺]. Loi-mai-lia, ‡ Lai-mo-leng,* Lai-mo-ling,* Lai-voe-lea. † Third highest range in Hainan, north of Five Finger Mountains and northeast of Red Mist Mountain. Summit 1,500 meters.

LOK-KEI * [洛基]. Northwest of Nodoo. Altitude about 175 meters.

LUNG-HOU-TONG * [龍口洞]. Lung-hou, Lung-tong. Villages about 50 kilometers south of Ting-on, northeastern Hainan. Altitude 200 meters (?).

MAN-FOOK-CHUEN * [萬福村]. Maan-fook-ts'uen.* A short distance from Nodoo.

MAN-GRIN. † Location unknown.

NAAM-PO. See Nam-po-ts'uen.

NAI-SUEN * [汭船]. Ngai-shuen.* A few kilometers southeast of Nam-fung. Altitude about 200 meters.

NAM-CHA-CHUEN * [南茶村]. Five kilometers west of Nodoo. Altitude 175 meters.

NAM-FUNG † [南豐]. Nam-fong,* Naam-fung. Town 13 kilometers south of Nodoo, northcentral Hainan. Altitude 175 meters.

NAM-LIU-TIN * [南了田]. Several kilometers eastnortheast of Sam-kwong-ts'uen, northeast of Loi Mother Mountain. Altitude 325 meters.

NAM-PO-HUI * [南保墟]. Place near Nam-po-ts'uen, northeastcentral Hainan.

NAM-PO-TS'UEN * [南保村]. Naam-po, Nam-po. Village east of Chung-kon-ts'uen, northcentral Hainan. Altitude about 300 meters.

NAM-TING-TS'UEN * [南定村]. Village 16 kilometers northeast of Sam-a, southern Hainan.

NGAI-UEN CITY. See Ngai-chau.

NGAI-CHAU * [崖州]. Ngaai-uen, Ngai-chow,* Ngai-chiu, † Ngai-tsiu, † Ai-hsien,* Yai-sien.* District city near southern coast, west of Sam-a.

NGAI-CHOW. See Ngai-chau.

NGOR-MA-CHUEN. Village south of Nodoo. Altitude 180 meters.

NODOO † [那大]. No-tai,* Noh-tai.* Town in northcentral Hainan. Altitude about 180 meters.

NO-KYU-CHUN ‡ [峇叫村]. Village in central Hainan. Altitude about 500 meters (?). Exact location uncertain.

PAAI-POON-TS'UEN * [拜本村]. Village in southern Hainan, about 35 kilometers north of Sam-a. Altitude about 125 meters.

PO-TING * [那亭]. Bo-deng, † Po-teng-shi.* Loi Village about 8 kilometers southwest of the Seven Finger Mountains, and about 35 kilometers northnortheast of Sam-a, southern Hainan. Altitude 125 meters.

SA-BO-LENG. See Dome Mountain.

SAM-A * [三亞]. Sama, Ta-ngae. † Town just north of Sam-ah-kong, port near southern tip of Hainan.

SAM-AH-KONG * [三廣溪]. Port in Yai District, at southern end of Hainan.

- SAM-KWONG-TS'UEN * [三墟村]. Village eastsoutheast of Chung-kon-ts'uen, and northwest of Tai-pin-ts'uen, central Hainan. Altitude about 325 meters.
- SAM-TS'UEN-KAI-HUI * [三村亞港]. Place south of Yin-ko-au and west of Loi Mother Mountain, central Hainan. Altitude about 425 meters.
- SHA-BO-LENG. *See* Dome Mountain.
- SHA-PO-SHAN. *See* Dome Mountain.
- SHUIMAN ☆ [水門]. Shui-moon.* South of Five Finger Mountains, southcentral Hainan. Altitude about 400 meters.
- TA-HAN ‡ [他寒]. Ta-an, ‡ Ta-hon.* Group of villages east of Red Mist Mountain and northwest of Fan-hiang. Altitude 750 meters.
- TA-HAU ‡ [他厚]. Village southwest of Vo-lau, northwestern Hainan; 35 kilometers westsouthwest of Nodoa. Altitude about 150 meters.
- TA-HIAN. ‡ Ta-sian-kwan. ‡ Group of Loi villages on upper reaches of north side of Five Finger Mountains, southcentral Hainan. Altitude 600 meters.
- TAI-CHAU ISLAND. *See* Tin-hosa.
- TAI-PO * [大埔]. Southeast of Chung-kon-ts'uen, and north of Loi Mother Mountain, central Hainan; 40 kilometers eastsoutheast of Nam-fung. Altitude 350 meters.
- TAI-CHAU ISLAND. *See* Tin-hosa.
- TAI-PIN-TSUEN. *See* Dwa-Bi.
- TAI-TSING-LAM-TS'UEN * [大村林村]. Village south of Loi Mother Mountain, central Hainan. Altitude 400 meters.
- THE HUMMOCKS. *See* Hummocks.
- TING-AN. *See* Deng-an.
- TING-ON. *See* Peng-an.
- TIN-HOSA † ISLAND [大洲島]. Taai-chau * Island. A double island off the southeastern coast of Hainan, in Wan-ning District.
- TRIANGULAR MOUNTAIN [三角山]. Ta-kok-toa, ‡ Sam-kok-san.* Mountain south of Loi Mother Mountain, central Hainan.
- TUN-HEUNG-TS'UEN * [端向村]. Village 10 kilometers southeast of Nodoa. Altitude 190 meters.
- VO-LAU ‡ [渦流]. Woh-lau. Town about 30 kilometers westsouthwest of Nodoa, northwestern Hainan. Altitude about 160 meters.
- WONG-LUNG-CHUEN ☆ [王籠村]. Wong-lung-ts'uen. Village northeast of Nodoa. Altitude 190 meters.
- WUCHIH-SHAN * (*See* Five Finger Mountains).
- YAU-MA-WOH * [油蔴窩]. Yiu-ma-wa. ☆ Place at east end of Dome Mountain, northwest of Nam-fung, northcentral Hainan. Altitude 190 meters.
- YIN-KO-AU * [鸚哥凹]. Mountain northwest of Loi Mother Mountain, central Hainan. Altitude about 1,225 meters.
- YOU-BOI. ¶ Location unknown.
- YUAN-MEN-TUNG ☆ [源門青]. Place in southern Hainan, near Sam-a.

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²³ Only articles marked with asterisks deal with Hainan in any way; the others pertain to species or genera recorded from Hainan for the first time in this work, or with species of which subspecies are herein described.

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ILLUSTRATIONS

[Plates 1 to 6 consist entirely of enlarged or natural-size photographs of dorsal aspects of Hainan longicorn beetles, partly taken by Mr. Charles Wilson and partly by Mr. W. Harry Lange and the author. Plate 7 consists of frontal outline drawings of Hainan longicorns of the subfamily Lamiinae, partly drawn by Mr. J. Gomez and partly by the author. Plate 8 is a map of Hainan Island, drawn up by the author and based on the outline map published by F. A. McClure in Lingnan Sci. Journ. 12 (1933) pl. 18, and inked in by Mr. J. Gomez.]

PLATE 1

- FIG. 1. *Baladeva walkeri* Waterhouse, male; $\times 1$. Nodda, Hainan Island.
 2. *Macrotoma (Zooblaæ) hainana* Gressitt sp. nov., holotype, male; $\times 1$.
 3. *Plocæderus obesus* Gahan, male; $\times 1$. Tai-pin (Dwa-Bi).
 4. *Philus pallescens tristis* Gressitt subsp. nov., holotype, male; $\times 1.55$.
 5. *Philus pallescens tristis* Gressitt subsp. nov., allotype, female; $\times 1.55$.
 6. *Chloridolum loochooanum hainanicum* Gressitt subsp. nov., holotype, male; $\times 1.55$.
 7. *Sclethræ stenocylindricus* Fairmaire, female; $\times 1.55$. Tai-pin.
 8. *Purpuricenus malaccensis* (Lacordaire), male; $\times 1.55$. Tai-pin.
 9. *Chelidonium argentatum* (Dalman), male; $\times 1.55$. "The Hummocks".
 10. *Leontium nigroscutellatum* Gressitt sp. nov., holotype, female; $\times 1.55$.
 11. *Embrik-Strandia unifasciata* (Ritsema), female; $\times 1.55$. Ting-on.

PLATE 2

- FIG. 1. *Noemia submetallica* Gressitt sp. nov., holotype, male; $\times 3.03$.
 2. *Ceresium geniculatum* White, male; $\times 3.03$. Sam-a.
 3. *Ephies gahani* Gressitt sp. nov., holotype, male; $\times 3.03$.
 4. *Kunbir pallidipennis* Gressitt sp. nov., paratype, female; $\times 3.03$.
 5. *Epipedocera hoffmanni* Gressitt sp. nov., holotype, female; $\times 3.03$.
 6. *Demonax matsushitai reticulicollis* Gressitt subsp. nov., holotype, female; $\times 3.03$.
 7. *Perissus kankauensis chungkonensis* Gressitt subsp. nov., holotype, male; $\times 3.03$.
 8. *Rhaphuma pieli* Gressitt sp. nov., holotype, female; $\times 3.03$.
 9. *Xylotrechus nigrosulphureus* Gressitt sp. nov., holotype, male; $\times 3.03$.
 10. *Chlorophorus separatus* Gressitt sp. nov., holotype, female; $\times 3.03$.
 11. *Chlorophorus macaumensis* (Chevrolat), male; $\times 3.03$; Kachek.
 12. *Chlorophorus reductus* Pic, female; $\times 3.03$. Shuiman.
 13. *Chlorophorus hainanicus* Gressitt sp. nov., holotype, female; $\times 3.03$.

PLATE 3

- FIG. 1. *Epepeotes tonkinensis* (Aurivillius), male; \times 1.7. Cheung-kon-ts'uen.
2. *Psacotheta inarmata* Gressitt sp. nov., holotype, male; \times 1.7.
 3. *Coptops leucostictica rustica* Gressitt subsp. nov., holotype, male; \times 1.7.
 4. *Coptops lichenia* Pascoe, female; \times 1.7. Tai-pin-ts'uen.
 5. *Mesosa maculifemorata* Gressitt sp. nov., paratopotype, male; \times 1.7.
 6. *Mesocacia assamensis* Heller, female; \times 1.7. Tai-pin-tsu'en.
 7. *Pelargoderus apicalis* Gahan, female; \times 1.55. Ta-hau.
 8. *Blepephæus subcruciatu* (White), male; \times 1.55. Sam-a.
 9. *Niphona excisa* Pascoe, male; \times 1.55. Chung-mei.
 10. *Lychrosis zebrinus* Pascoe, female; \times 1.55. Tai-pin-ts'uen.
 11. *Palimna annulata tessellata* Pascoe, male; \times 1.55. Nodoo.

PLATE 4

- FIG. 1. *Hainanhammus griseopubens* Gressitt sp. nov., paratype, male; \times 2.5.
2. *Chæromorpha formosana palminsulana* Gressitt subsp. nov., holotype, female; \times 2.5.
 3. *Niphona minor* (Lameere), male; \times 2.5. Sam-ah-kong.
 4. *Lychrosis fasciatus* Gressitt sp. nov., holotype, male; \times 2.5.
 5. *Pterolophia albonigra* Gressitt sp. nov., holotype, female; \times 2.5.
 6. *Pterolophia arctofasciata* Gressitt sp. nov., allotype, male; \times 2.5.
 7. *Rondibilis seatonii* Gressitt sp. nov., holotype, female; \times 2.5.
 8. *Euseboides matsudai spinipennis* Gressitt subsp. nov., holotype; \times 2.5.
 9. *Apomecyna cantator excavaticeps* Pic, male; \times 2.5. Yuan-men-tung.
 10. *Apomecyna cantator excavaticeps* Pic, female; \times 2.5. Sam-a.
 11. *Enispia tholana* Gressitt sp. nov., holotype, female; \times 2.5.
 12. *Enispia quadristigma* Gressitt sp. nov., paratype, male; \times 2.5.
 13. *Phesates marmoratus* Gressitt sp. nov., holotype, male; \times 2.5.
 14. *Xenolea tomentosa asiatica* (Pic), male; \times 2.5. Ta-hau.
 15. *Pothyne seriata* Gressitt sp. nov., holotype, female; \times 2.5.
 16. *Pothyne obliquetruncata* Gressitt, male; \times 2.5. Tai-pin.
 17. *Pothyne chocolata* Gressitt, female; \times 2.5. Ta-hau.
 18. *Tetraglenes insignis sublineatus* Gressitt, male; \times 2.5. Nam-fung.

PLATE 5

- FIG. 1. *Apomecyna quadrifasciata* Thomson, female; \times 4. Yuan-men-tung.
2. *Eunidia lateralis* Gahan, female; \times 4. "Hainan Id."
 3. *Serixia sedata* Pascoe, female; \times 4. Ta-hian.
 4. *Serixia longicornis pubescens* Gressitt subsp. nov., holotype, male; \times 4.
 5. *Pterolophia kaleea* (Bates), female; \times 4. Tai-pin.
 6. *Atimura cylindrica* Gressitt sp. nov., holotype, female; \times 4.
 7. *Serixia abbreviata* Gressitt sp. nov., holotype, male; \times 4.

- FIG. 8. *Iproca acuminata* Gressitt sp. nov., holotype, male; \times 4.
 9. *Ropica sublineata* Gressitt sp. nov., holotype, male; \times 4.
 10. *Mizania laterimaculata* Gressitt sp. nov., holotype, male; \times 4.
 11. *Sybra pascoei* Lameere, male; \times 4. Ta-han.
 12. *Exocentrus constricticollis* Gressitt sp. nov., holotype, female; \times 4.
 13. *Enispia anfracta* Gressitt sp. nov., allotype, female; \times 4.
 14. *Pseudanæsthetis seticornis* Gressitt sp. nov., holotype; female, \times 4.
 15. *Terinæa rufonigra* Gressitt sp. nov., holotype, male; \times 4.
 16. *Exocentrus basirufus* Gressitt sp. nov., holotype, male; \times 4.
 17. *Exocentrus trifasciellus* Gressitt sp. nov., holotype, male; \times 4.

PLATE 6

- FIG. 1. *Glenida cyaneipennis* Gahan, male; \times 3.03. Sam-a.
 2. *Glenea flavorubra* Gressitt sp. nov., allotype, female; \times 3.03.
 3. *Glenea tonkinea* Aurivillius, female; \times 3.03. Tai-pin-ts'uen.
 4. *Glenea humerosa* Gressitt sp. nov., holotype, male; \times 3.03.
 5. *Glenea (Stiroglenea) cantor* (Fabricius), male; \times 3.03. Lia-mui.
 6. *Nupserha corrugata* Gressitt sp. nov., holotype, male; \times 3.03.
 7. *Nupserha kankauensis* (Schwarzer), female; \times 3.03. Ta-hian.
 8. *Nupserha fricator* Dalman, male; \times 3.03. Fan-ta.
 9. *Oberea nigriventris* Bates, female; \times 3.03. Ta-hian.
 10. *Oberea fuscipennis* Chevrolat, female; \times 3.03. "The Hummocks".
 11. *Oberea rosi* Gressitt sp. nov., holotype, female; \times 3.03.
 12. *Oberea nigriceps* (White), female; \times 3.03. Tai-pin-ts'uen.
 13. *Lasiophrys tinkosensis* Gressitt sp. nov., holotype, male; \times 3.03.
 14. *Astathes cyanoptera* Gahan, male; \times 3.03. Tinhosa Island.

PLATE 7

- FIG. 1. *Mesocacia assamensis* Heller, male; \times 7.1. Tai-pin-ts'uen.
 2. *Mesocacia punctifasciata* Gressitt sp. nov., holotype, female; \times 7.
 3. *Mesocacia rugicollis* Gressitt sp. nov., holotype, female; \times 6.3.
 4. *Niphona yanoi reducta* Gressitt subsp. nov., holotype, male; \times 8.
 5. *Cacia nigrofasciata* Gressitt sp. nov., holotype, female; \times 11.7.
 6. *Iproca acuminata* Gressitt sp. nov., holotype, male; \times 22.
 7. *Neacanista tuberculipenne* Gressitt sp. nov., holotype, female; \times 10.7.
 8. *Ropica ngauchilæ* Gressitt sp. nov., holotype, male; \times 20.

PLATE 8

Outline map of Hainan Island, showing the thirteen district cities (all near the coast except Deng-ag) and key localities and mountain ranges in the interior. See page 228 for list of localities for other place names, their locations, various romanizations, and altitudes.

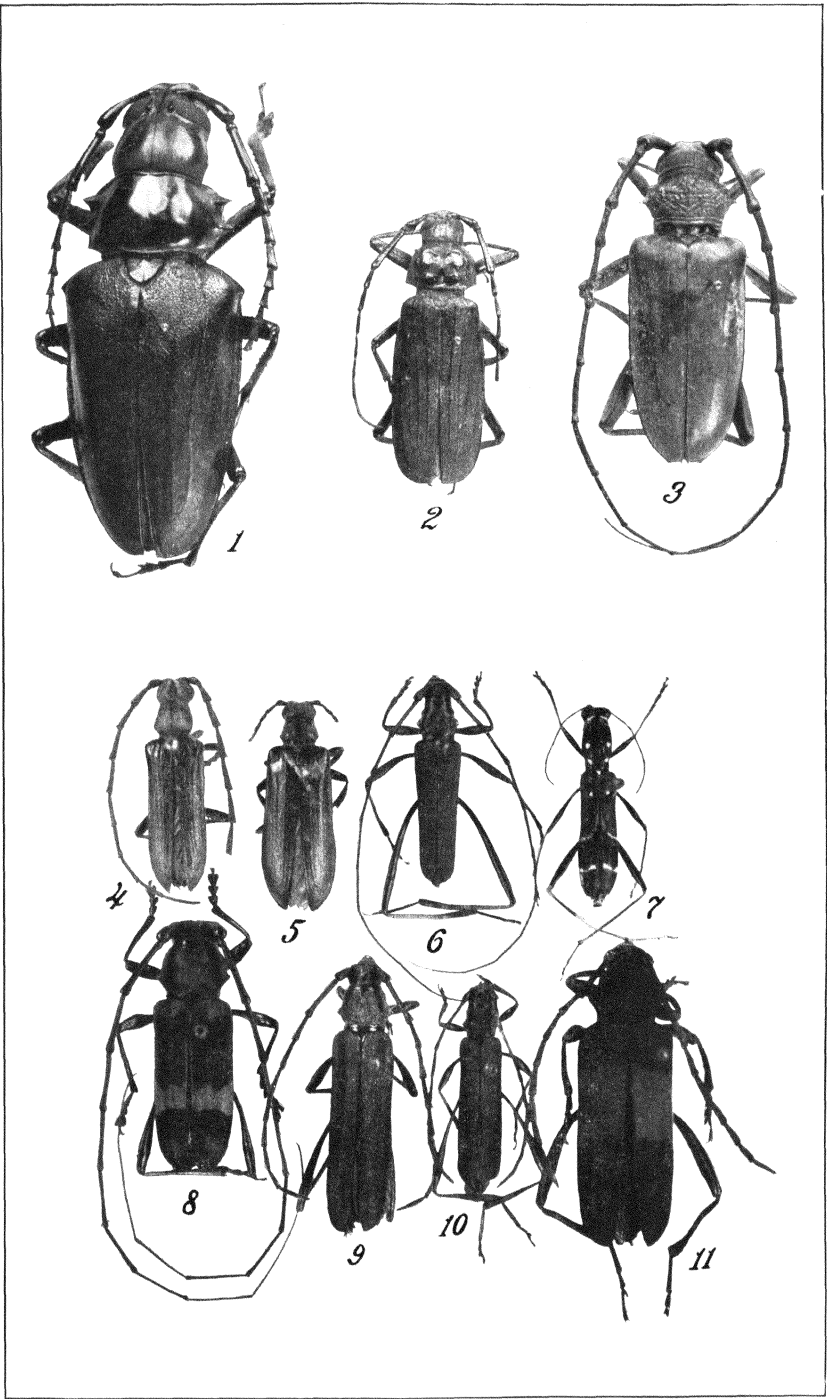


PLATE 1.

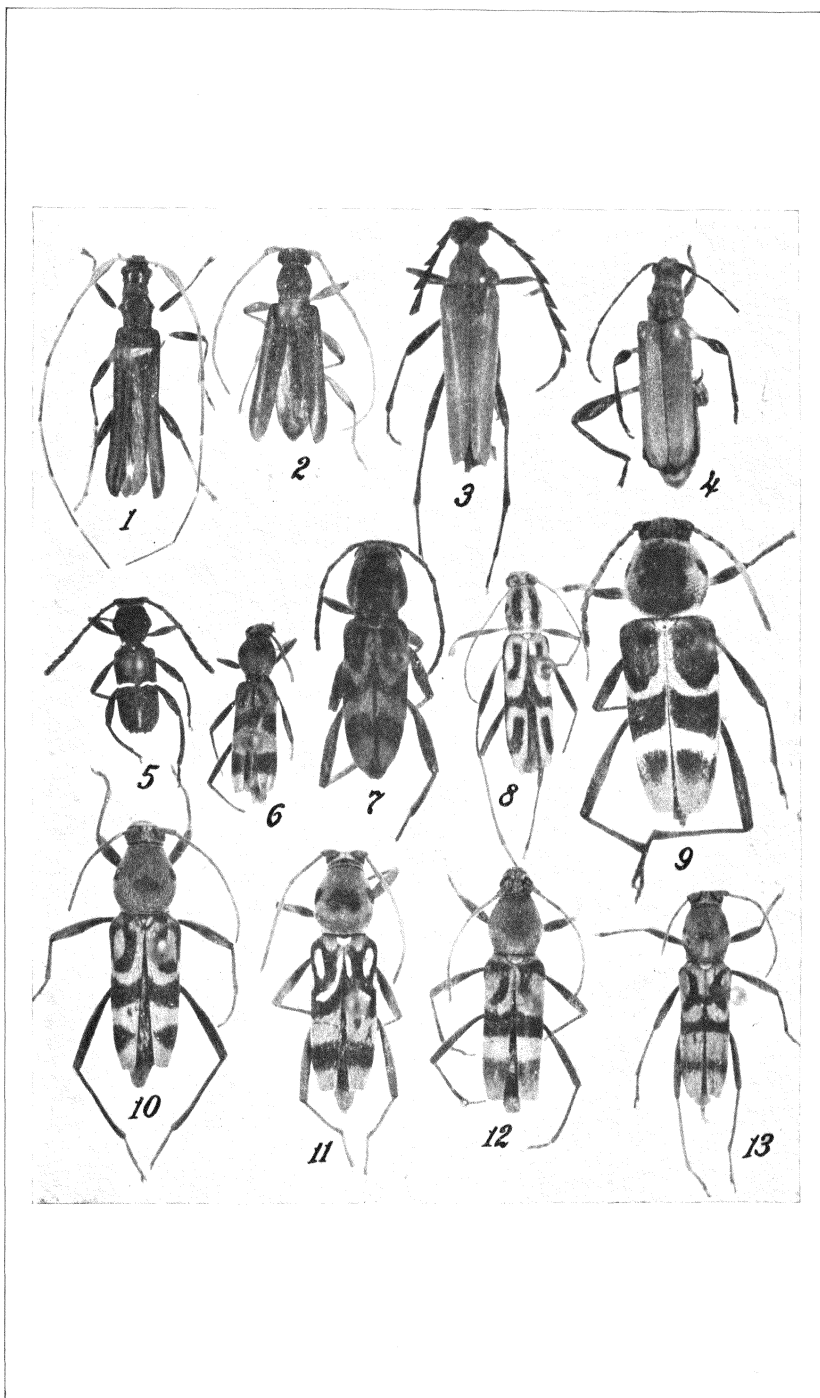


PLATE 2.

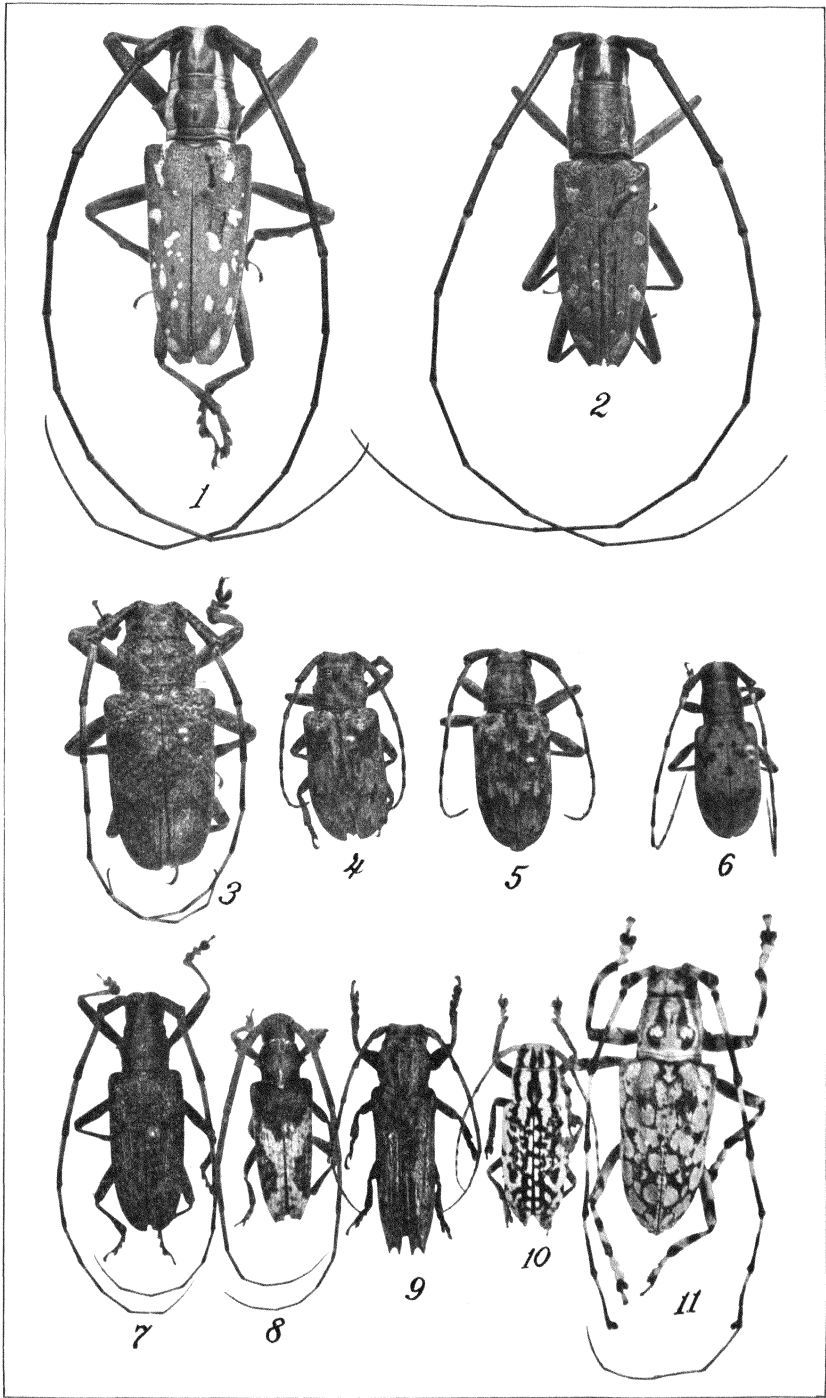


PLATE 3.

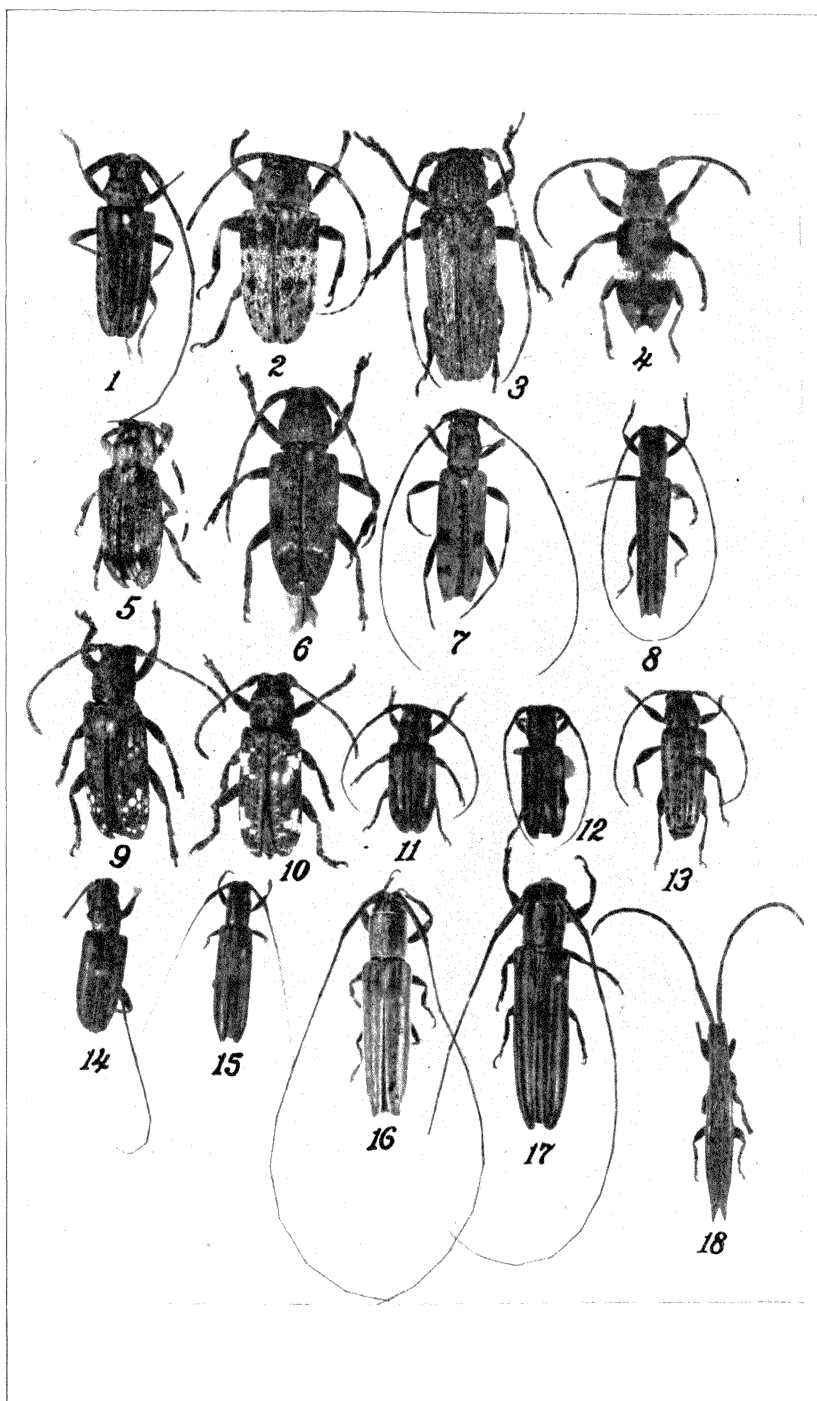


PLATE 4.

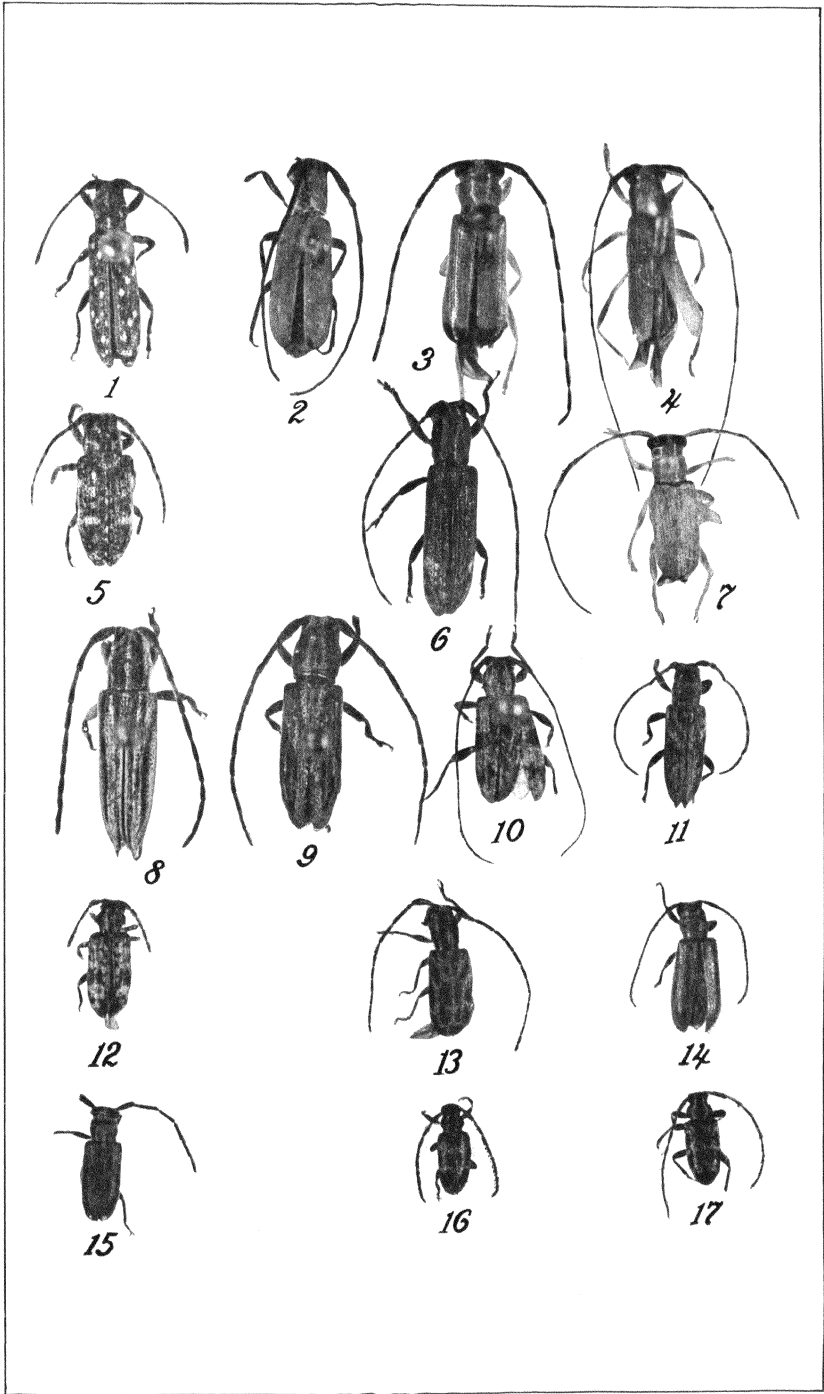


PLATE 5.

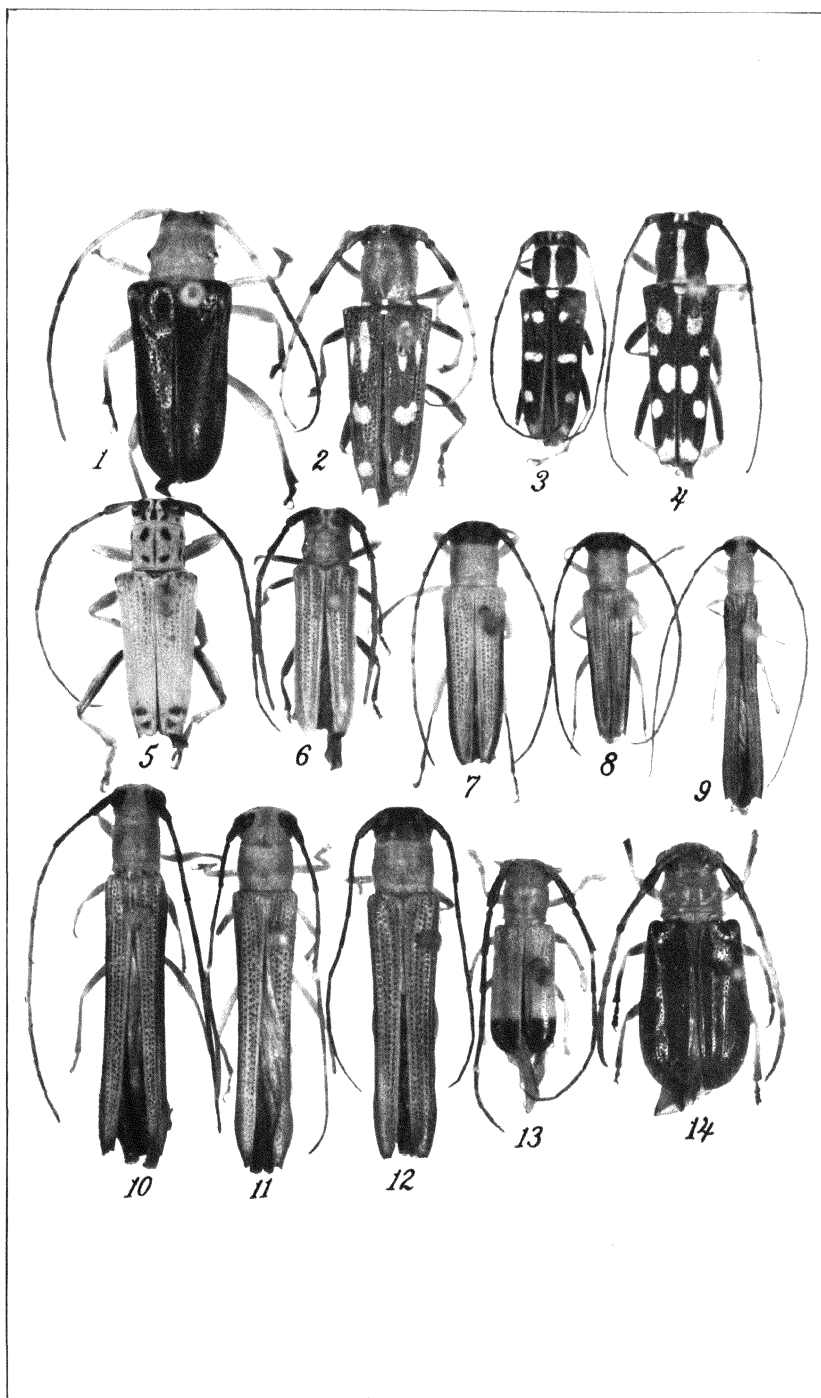


PLATE 6.

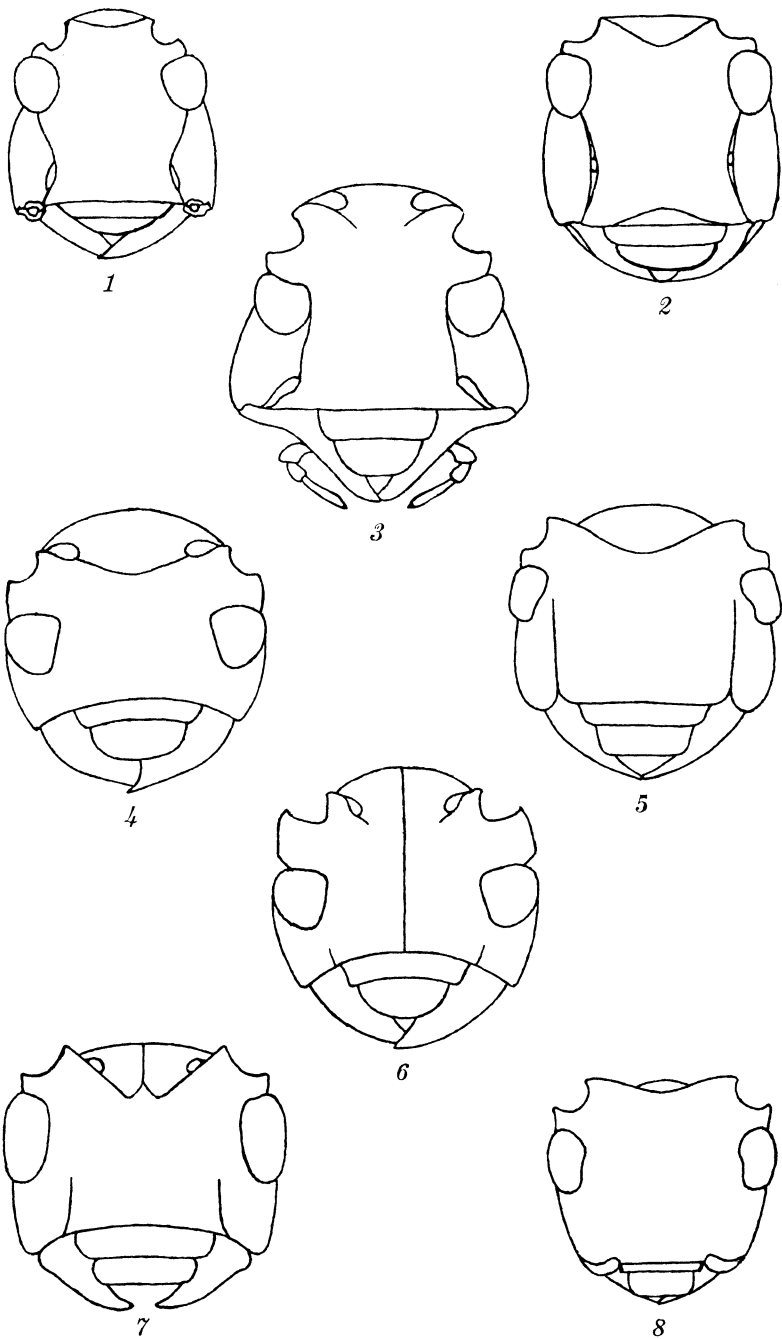


PLATE 7.

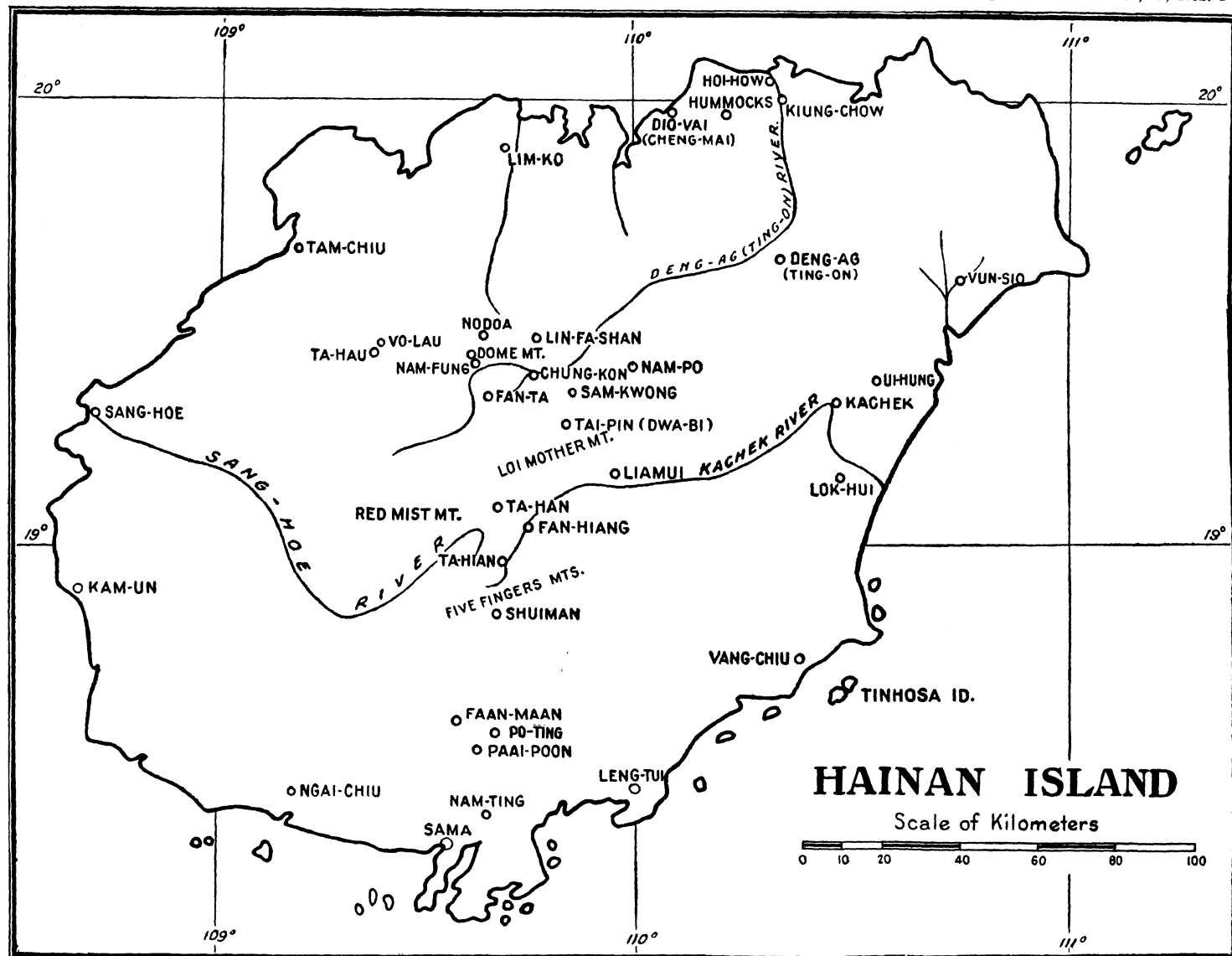


PLATE 8. Outline map of Hainan Island, showing the thirteen district cities (all near the coast except Deng-ag) and key localities and mountain ranges in the interior.

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WILLIAM HENRY BROWN

By CIRILO B. PEREZ

Of the Scientific Library, Bureau of Science, Manila

ONE PLATE

William Henry Brown, botanist and last American director of the Bureau of Science, died quite unexpectedly November 9, 1939, in Baltimore, Maryland, following a heart attack. He was fifty-five years old. Doctor Brown will be missed by his colleagues and associates at the Bureau of Science during his long tenure of office. In the sudden death of this prominent botanist, the scientific world sustained a great loss. He came to the Bureau of Science in 1911 as a plant physiologist; he retired from the Bureau in 1933, after 22 years of distinguished service, as one of the foremost authorities on Philippine flora. As administrator of the Bureau of Science he achieved notable success.

Doctor Brown was born in Richmond, Virginia, October 6, 1884. He received his Bachelor of Science degree from Richmond College in 1906 and his Doctor of Philosophy from Johns Hopkins University in 1910. Before coming to the Philippines he was scientific assistant at the United States Laboratory in Beaufort, North Carolina; student assistant, graduate assistant, fellow, and later Bruce fellow of Johns Hopkins; he engaged in botanical investigations in Jamaica in 1910; he was assistant of the Desert Laboratory of Carnegie Institution and of the Michigan Agricultural Experiment Station, then instructor in plant physiology at the Michigan Agricultural College.

In 1911, one year after he received his doctor's degree from Johns Hopkins University, Doctor Brown joined the Bureau of Science as plant physiologist. He brought to bear upon his duties a ripe experience as a botanist, obtained both in temperate and in tropical regions. In 1914 he was appointed assistant,

Section of Botany, and in 1915, botanist. From 1915 to 1924 he was associate professor, professor, and head of the Department of Botany of the University of the Philippines. At the time of his appointment as Director of Science he was professor of botany and acting head of the Department of Botany of the College of Liberal Arts, University of the Philippines. In 1925, after a year of discharging the numerous responsibilities of both positions, he found it difficult to give as much time as he should to the running of the Department of Botany, and it was with considerable regret that he asked to be released as acting head of this Department. He served as chief of the Division of Investigation of the Bureau of Forestry from 1919 to 1920. In 1921 he transferred again to the Bureau of Science as botanist. He became Director of Science in 1924, holding this important post until his retirement, November 30, 1933. The records of these various positions show that Doctor Brown was constantly in demand for advice and instruction. Johns Hopkins called him back in 1938, to be a lecturer in botany and to take charge of the botanical laboratory and garden.

Doctor Brown's reputation as a botanist was based mainly on his studies of Philippine vegetation. One has but to read the list of his publications to find that from 1911 to 1938, his time was devoted almost entirely to the study of Philippine plants and forests. He listed and described hundreds of plants. He wrote 53 papers and books, besides his administration reports. Ecology, morphology, physiology, and economic botany are his forte. His works appear principally in the *Philippine Journal of Science*, the *Philippine Bureau of Forestry* bulletins, and the *Botanical Gazette*. Scientists and students will connect his name with: *Vegetation of Philippine mountains*, *Minor Products of the Philippine Forests*, *The Plant Kingdom*, *A Textbook of Botany*, *Laboratory Manual of Botany*, and *General Science for Philippine schools*. Many of his works are used as textbooks in the schools throughout the Philippines, at the University of the Philippines, and abroad.

His publications are enduring monuments to their author. Of his "Textbook of General Botany" and "Laboratory Botany," Franklin P. Metcalf, Professor of Botany at Lingnan University, Canton, China, said in 1925: "He has a treatment quite different from the average run of botany textbooks . . . next year I may try it as I do not believe in always using the same textbook. His book has excellent figures and almost all are new ones. His figures in themselves make an excellent book." When it was

first published professors in the Universities of Illinois and Queensland planned to use it as the textbook to teach elementary botany. These are indications that the books have been written from a general rather than from a local point of view. They are suitable to any climate or region.

November 27, 1933, a contract was entered into between the Philippine Government and Doctor Brown to the effect that he would deliver to the Philippine Government a book dealing with Philippine botany which he was then preparing in consideration of the sum of 7,280 pesos.¹ The result is his monographic work on the useful plants of the Philippines, which was still in the process of editing when he died. This work of three volumes deals with individual species, or, in a few cases, of individual genera. It is profusely illustrated, containing 457 drawings of over a thousand figures, which will enhance its value to the public and to scientists. After complying with the terms of the contract, Doctor Brown used his time freely in revising and improving the manuscript. There had been considerable delay in connection with minor matters of putting the finishing touches on the illustrations and of bringing the manuscript up-to-date. On it, Doctor Brown did much work during the last five years of his life. He believed that this book would be of great value to the Philippine Government, and that this was the only means by which he could make available to the public the considerable store of information that he, as a botanist, had gathered at government expense during his twenty-two years of service. This monograph will be a monument to Doctor Brown, and his greatest achievement in science in the Philippines. Professor H. H. Bartlett, exchange professor to the University of the Philippines from the University of Michigan, and Chairman of the technical committee to look into the status of and report on Doctor Brown's manuscript on Useful Plants of the Philippines, said: "I am convinced that the work in question is extremely valuable from the standpoint of public instruction."

The Bureau of Science under Doctor Brown's administration maintained the high position it had attained among the leading scientific institutions of the world. Although administrative duties prevented him from devoting his whole time to scientific research, it was during this period that his valuable and practical publications were published.

Doctor Brown believed that the Bureau of Science, with its Scientific Library, offers an excellent place for training real

¹ One peso equals 50 cents United States currency.

scientists. As a scientist and an administrator, Doctor Brown had for one of his most important objectives the training of competent and promising Filipino personnel for the Bureau. He made special efforts to obtain fellowships abroad for members of distinct ability in the Bureau. He searched for men of special aptitudes for the various lines of work carried on by the Bureau of Science. Doctor Brown and Doctor E. D. Merrill were able to secure the services of Doctor Eduardo Quisumbing, one of the foremost Filipino systematic botanists. Doctor Marcos Tuban-gui, an outstanding parasitologist and protozoölogist, and Doctor Salvador del Mundo, a brilliant chemist, were among the "promising materials" spotted by Doctor Brown.

Immediately upon his assumption of the directorship of the Bureau of Science, Doctor Brown planned a building program. The activities of the Bureau were increasing so greatly that the work was seriously hampered by the crowded condition in the laboratories. He realized the absolute necessity of extensions to the building if the efficiency of the service was to be maintained. The library and the botanical and entomological collections were so crowded that it was exceedingly difficult to consult them. He had a vision of extensions of the Bureau of Science towards the Philippine General Hospital. A part of his plan was realized when the old animal house was converted into eight well-equipped laboratory rooms in 1925 and when the west wing was completed in 1931. During his administration the cement laboratory, the Cebu laboratory, and the fishponds were constructed; the tikitiki plant, the testing and assay laboratories, and the Alabang serum laboratory, were extended and improved; and additional bookstacks were installed in the Scientific Library.

A high tribute was paid to Doctor Brown when the Philippine Research Institute made him its first president. The Institute was a private nonstock corporation organized in 1929 "to conduct, encourage, promote and foster scientific research in the Philippines." At that time there was no institution in the Philippines primarily interested in pure research. Aware of the almost unlimited possibilities for profitable scientific investigation in the Philippines, the Institute aimed to make use of the favorable situation of the Philippines as a center of tropical research. The Institute hoped that more systematic and larger efforts along research lines may be developed, and that Filipinos may be given more incentive along lines of research.

The incorporators of the Institute were encouraged to believe that they could obtain coöperation and financial backing here

and in the United States. The Government agreed to furnish quarters and general facilities for the work of the Institute. It prepared a program of research over a period of five years. Several fellowships were already in sight then.

Although the Institute was short-lived, the idea that animated it still lives in the National Research Council of the Philippines.

The Philippine Journal of Science loses a valued contributor in Doctor Brown, who served as associate editor from 1912 to 1924 and as editor-in-chief from 1924 until his retirement as director of science.

Doctor Brown was an active member of various societies covering the scientific and botanical fields here and abroad. The defunct Philippine Research Institute elected him its president in 1929. He was a fellow of the American Association for the Advancement of Science and a member of the Botanical Society of America, the Ecological Society of America, the American Meteorological Society, Phi Gamma Delta, Gamma Alpha, and Phi Beta Kappa. He was given a complimentary ten-year membership in the Source research council, Incorporated, of Chicago, Illinois, 1928-1938. He acted as consultant on questions on botany and other sciences in the Philippines. He served at various times on several important committees of the National Research Council of the Philippines and other scientific societies. During the mining boom of 1936 and 1938, he served as director of the San Mauricio Mining Company and of Marsman and Company, Incorporated. He was a Mason and a member of the University Club, Rotary Club, Manila Polo Club, and the Elks Club.

His wife, Mary Angus Blythe, and two sons survive him.

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ILLUSTRATION

PLATE 1. WILLIAM HENRY BROWN



PLATE 1. WILLIAM HENRY BROWN

THE INCIDENCE OF PLASMODIUM AND HÆMOPROTEUS INFECTIONS IN SOME PHILIPPINE BIRDS

By FRANCISCO J. DY and LILY J. SORIANO

Of the Department of Parasitology, Institute of Hygiene, University of the Philippines, Manila

The existence of natural *Plasmodium* and *Hæmoproteus* infections in birds is a matter of common knowledge. Investigations along this line have been undertaken by Huff,⁽²⁾ who recorded *Plasmodium* infections in 79 species of birds and estimated about twice as many *Hæmoproteus* infections. In the Philippines, Hegner and Chu⁽¹⁾ found three *Plasmodium* and seven *Hæmoproteus* infections in 95 birds belonging to 47 species. In 1932 Russell⁽³⁾ published a survey of *Plasmodium* and *Hæmoproteus* infections in birds of Luzon, and of 604 blood smears from 46 species of birds, 10 per cent were positive for *Plasmodium*, 19 per cent for *Hæmoproteus*, and 18 per cent for mixed infection of *Plasmodium* and *Hæmoproteus*. Although the result of Russell's survey gives a fairly good estimate of the percentage of *Plasmodium* and *Hæmoproteus* infections with regard to the 604 birds taken as a whole, it is quite insignificant when we take the individual species of birds into consideration, because in most of the species studied by him, only 1 or 2 birds were examined. We believe that in the determination of the incidence of infection in a species of birds a more accurate result can be obtained if a greater number of birds belonging to a given species is examined.

In connection with our work on avian malaria, we had opportunity to examine a considerable number of birds belonging to 3 species; namely, *Padda oryzivora*, commonly known as Java sparrow (*mayang costa*); *Munia jagori*, the Philippine weaver (*mayang pula*); and *Excalfactoria lineata*, the Island painted quail (*pugó*). We also examined a number of domestic doves, *Columba livia*, and canaries, *Serinus canarius*. Our Java sparrows and Philippine weavers were bought from peddlers who caught them in the provinces around Manila during 1938 and 1939. The island painted quails were bought from Pampanga, Rizal, and Surigao Provinces during July, August, and Sep-

tember, 1938. We presume that the infection in the birds found positive was natural, because these birds were caught in the wild state and were examined immediately after they were bought. The domestic doves were bought from market vendors who raised them in the suburbs of Manila, while the canaries were bought from Chinese dealers who imported them from China. The blood was examined by making thin smears and staining them with modified Giemsa stain, after which they were viewed under the oil-immersion objective.

RESULTS

The results of our investigation with regard to the 4 species of Philippine birds studied are shown in Table 1. Thirty-two canaries were examined, and all were found negative for *Plasmodia* or *Hæmoproteus*. Morphologically the *Plasmodia* found in the 3 species apparently belong either to *Plasmodium præcox* or to *P. circumflexum*. The infection with *P. circumflexum*, however, was found only in 2 Java sparrows, *Padda oryzivora*, the rest of the infection being that of *P. præcox*. The *Hæmoproteus* observed in our birds is morphologically similar to *Hæmoproteus columbæ* Celli and Sanfelice, 1891(4).

TABLE 1.—Incidence of parasites in birds examined.

Species.	Number examined.	<i>Plasmodium</i> .		<i>Hæmoproteus</i> .		Mixed infection.	
		Number positive.	Per cent positive.	Number positive.	Per cent positive.	Number positive.	Per cent positive.
<i>Padda oryzivora</i>	264	12	4.5	0	0	0	0
<i>Munia jagori</i>	232	16	6.8	0	0	0	0
<i>Excofactoria lineata</i>	200	6	3.0	84	42	5	2.5
<i>Columba livia</i>	32	0	0	26	81.2	0	0
Total.....	728	34	4.6	110	15.1	5	0.6

SUMMARY

The results of the examination of the blood smears of more than 700 Philippine birds, belonging to 4 species, and a number of imported canaries, *Serinus canarius*, are reported. Morphologically the parasites found apparently belong to the species *Plasmodium præcox*, *P. circumflexum*, and *Hæmoproteus columbæ* Celli and Sanfelice, 1891.

ACKNOWLEDGMENTS

The authors are indebted to Dr. Candido M. Africa, head, Department of Parasitology, Institute of Hygiene, University of the Philippines, for suggesting and directing this work and for revising the manuscript. We are also grateful to Dr. C. G. Manuel, who helped us in the identification of our birds.

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CHIRONOMOIDEA FROM JAPAN (DIPTERA), XII¹

NEW OR LITTLE-KNOWN CERATOPOGONIDÆ AND CHIRONOMIDÆ

By MASAOKI TOKUNAGA

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FOUR PLATES

Most of the midges discussed in this paper were collected in Formosa by Dr. R. Takahashi and by myself. A rather extensive collection from Hokkaido and southern Sakhalin was sent to me by Mr. M. Akizuki. A few scattered specimens from various parts of Honsyu and Kyusyu were collected by Messrs. Y. Yoshimura, Y. Ito, K. Shibuya, and by myself. All the specimens described at this time are preserved in our entomological laboratory. I wish to express my very deepest thanks to the above-mentioned entomologists for their cordial cooperation in this study of the chironomid midges of Japan.

The term 'antennal ratio' is used to express the length of the distal elongated segments of the antenna in relation to the remaining proximal short segments of the flagellum. The leg ratio is the length of the first tarsal segment in relation to the length of the tibia. The proportional lengths of the segments of the leg are used to express the relative lengths of the segments from the femur to the last tarsal segment. The method of description employed and the terms adopted in the text are the same as those used by myself in a number of recent papers.

CERATOPOGONIDÆ

CULICOIDES UNGUIS sp. nov.

Female.—Body about 2 mm long. Thorax black, slightly shiny. Eyes very finely pubescent. Wings without colored markings, with macrotrichia only along extreme tip. Legs with claws equal, long, longer than fourth tarsal segment (4:3).

¹ Contribution from the entomological laboratory of Kyoto Imperial University, No. 89. The series of papers on the "Chironomidæ from Japan" is continued henceforth under the title "Chironomoidea from Japan."

Proboscis short, about half vertical length of head. Antennæ dark brown, with segments three to nine spherical, following five segments oval or cylindrical; antennal ratio about 1. Legs brown; third tarsal segment somewhat flattened; fourth segment obcordate; fifth segment cylindrical; claws simple and unusually long. Proportional lengths of segments of hind leg about 38:37:16:7:4:3:6. Wings (Plate 4, fig. 87) with macrotrichia along distal margin, without colored markings. Venation: second radial cell larger than first, fMCu under r-m; microtrichia present; radial veins brown. Halteres white. Abdomen black.

Holotype.—Female; Simogamo, Kyoto; August 8, 1931.

Paratopotypes.—Females; August 8, 1931.

This species is very distinctive in the possession of finely pubescent eyes and the long tarsal claws.

ALLUAUDOMYIA QUINQUEPUNCTATA sp. nov.

Female.—Body about 1.5 mm long. Thorax bicolorous: tergal side and dorsal half of either pleural side pure white, external side and ventral half of either pleural side brown. Wings with thick macrotrichia on distal third; radial cell only one, owing to absence of R_{2+3} ; five small black spots distinct.

Head brown, with a white spot on vertex. Eyes bare, just contiguous at dorsal side. Antenna with scapes yellow, flagellar segments white; antennal ratio about 0.88; proportional lengths of distal eight segments as follows: 16:5:16:16:19:21:23:24.5:30. Mouth parts brown; maxillary palpi white; third palpal segment not swollen; ultimate palpal segments slightly clavate. Thorax bicolorous, dorsal half pure white, ventral half brown; scutum setigerous, slightly shiny, without scutal spine; scutellum with a pair of long median and a pair of small lateral setæ. Legs bicolorous; coxæ and trochanters all brown; femora brown, in fore- and hind legs each with a white preapical ring and in middle leg white on distal half except dark distal end; fore tibia dark brown at both ends, broadly brown at middle, and with a white subbasal and preapical ring; middle tibia similar to fore tibia but middle brown ring very small and situated at distal fourth; hind tibia also similar to fore tibia but basal end entirely white; tarsal segments almost entirely white; only first segment of hind leg brown. Femora slender, without spines; tarsi without spurlike bristles; fourth tarsal segments of all legs flat, obcordate; fifth tarsal segments elongated, clavate, without strong ventral bristles; claws simple, very unequal; longer claw almost as long as fifth tarsal segment and shorter claws about three-fifths length of longer claw. Relative

lengths of segments 23:23:9:5:2:2:5 in foreleg; 32.5:29.5:15.5:6:2.5:2.2:5 in middle leg; and 26:27.5:11:4.5:3:2:4.5 in hind leg. Wings (Plate 2, fig. 19) with macrotrichia thick, distributed on distal third, veins colorless and hyaline, marginal fringe of setæ very long; radial cell only one; squama and alula bare; five dark spots distinct. Halteres white. Abdomen white.

Holotype.—Female; Kibune, Kyoto; June 1, 1930.

This species is characterized by the bicolorous thorax, the marking of the wings, the venation of the radial branches, and the distribution of the wing macrotrichia.

ALLUAUDOMYIA UNDECIMPUNCTATA sp. nov.

Male.—Body about 1.5 mm long. Mesothoracic scutum yellowish brown with brown clouds. Wing with eleven dark spots.

Antennæ yellowish white; antennal ratio about 0.87; proportional lengths of distal six segments about 10:10:17:27:32:33. Thoracic scutum yellowish brown, with two brown stripes along foveæ and two transverse brown clouds on either side; scutellum yellow; postscutellum and sternal and pleural sides extensively brown. Legs with coxæ and trochanters brown; yellowish brown on basal half, brown on distal half, and each with a yellowish-white preapical ring; tibiæ brown, each with a yellowish-white subbasal and preapical ring; tarsi all white. Proportional lengths of segments of forelegs about 20:18:9:4:2:1.7:3; of hind legs, about 20:20:10:4:2:1.7:3. Wings (Plate 2, fig. 20) dark brown basally, with eleven distinct dark spots. Venation: first radial cell slitlike, second radial cell small and obscure; macrotrichia on distal margin of cells R_5 , M_1 , and M_2 . Halteres white. Abdomen white; hypopygium brown.

Holotype.—Male; Kitasirakawa, Kyoto; May 13, 1933.

This species is distinguished from the other known species of the genus by the coloration of the thoracic scutum and by the wings.

ALLUAUDOMYIA SAGAENSIS sp. nov.

Female.—Body only 1.4 mm long, yellow in ground color. Mesoscutum brown, with numerous yellow spots. Wings with many dark-blue spots; macrotrichia sparse, spread on distal area. Legs with dark rings before and beyond knee joints; femora and tibiæ broadly dark at middle.

Antennæ with scapes yellow, elongated distal segments pale brown, short basal flagellar segments white on basal half and pale brown on distal half; antennal ratio about 1; ultimate segment tapering on distal third, with a preapical seta. Meso-

scutum with numerous yellow spots; scutellum brown, with a pair of yellow clouds; postscutellum brown; pleural and sternal sides extensively yellow; pleuron with a brown stripe arising from cervix ending at abdominal basis. Legs with coxæ yellow; trochanters brownish black; knee joints yellow; femora yellow on basal and apical parts, broadly dark at middle, each with a dark preapical ring; tibiæ yellow on basal and preapical parts, broadly dark at middle, narrowly dark on apical end, each with a dark ring on proximal part; tarsal segments white; third tarsal segment cordiform; fourth tarsal segment distinctly cordiform; fifth segment elongated, clavate; claws simple, very unequal; tarsal spines, pulvilli, and empodia all absent; proportional lengths of legs 20:19:7.5:3:5:1.7:1.5:5 in foreleg; 22:22:10:3.2:2:2:2:4.5 in hind leg. Wings (Plate 2, fig. 21) with many dark-blue spots; macrotrichia scanty, spread only on distal area; radial cell only one, owing to absence of R_{2+3} . Halteres yellow. Abdomen pale brownish yellow on tergal side; cerci yellow.

Holotype.—Female; Saga, Kyoto; August 18, 1937.

This species is distinguished from all other known species of *Alluaudomyia* by the coloration of the mesoscutum, legs, and wings.

MONOHELEA (MONOHELEA) TESSELLATA Zetterstedt.

Female.—Body about 2.8 mm long. Thoracic sclerites almost entirely brown, scutum with one pair of humeral, two pairs of lateral, and one pair of claudoscutal yellow spots, with numerous dark dots; scutellum with four long setæ and a median yellow spot. Wings with elaborate dark markings. Antennal ratio about 1.1. Legs yellowish brown, with dark-brown markings; tarsal segments with spurlike bristles; claws of hind leg unequal in length.

Eyes bare, contiguous to each other above; frontal aspect of head yellowish brown; mouth parts yellow. Antennæ with scapes and basal half of short flagellar segments yellow, distal half of short flagellar segments and all elongated distal segments brown. Legs with coxæ and trochanters brown; femora of fore- and middle legs yellowish brown, those of hind legs brown and very strong; all femora broadly dark at tip; tibiæ of fore and middle legs brown, those of hind legs dark brown and very thick; tarsi of fore- and middle legs pale yellow, those of hind legs yellowish brown; claws of fore- and middle legs equal in length, each with a basal tooth; those of hind legs

unequal in length (14:5), without basal tooth; proportional lengths of segments of hind leg as follows: 74:73:25:13:8:10:9. Wings (Plate 2, fig. 22) with veins brown, and with distinct dark markings; proportional lengths of first and second radial cells about 19:36, M_2 atrophied basally. Abdomen with dorsal side yellowish pale brown, ventral side yellowish brown on anterior segments and brown on posterior segments, lateral sides black due to dark subcutaneous pigment.

Specimen.—Female; Toyohara, Sakhalin; August 5, 1938.

CERATOPOGON (TRISHELEA) INCOMPLETA Kieffer.

Male.—Body about 1.5 mm long. Head and thorax entirely reddish brown. Wings with main veins yellowish white. Halteres white. Legs with tarsi white, other segments yellowish brown. Abdomen dark brown.

Antennæ brown; antennal ratio about 0.75; proportional lengths of distal five segments about 9:9:32:20:24. Wings with radial cells distinct and very short; second cell shorter than first; r-m almost as long as R_{4+5} ; fMCu under base of radial branches; M_2 completely absent. Hypopygium with styles (Plate 4, fig. 94) curved only at tip, bluntly swollen mesad at middle.

Specimen.—Male; Wati, Kyoto; May 17, 1936.

CERATOPOGON (TRISHELEA) ABDOMINALIS sp. nov.

This minute midge was collected from caves along the seashore.

Female.—Body only 1.3 mm long, almost entirely brown. Mesoscutum slightly shiny. Wings with two distinct radial cells, M_2 completely atrophied; macrotrichia very sparsely arranged in a line closely along distal margin of cells R_5 and M_1 . Abdomen white on anterior three segments, brown on other posterior segments, and dark on lateral sides.

Head brown. Antennæ mainly white, with scapes brown; segments two to nine spherical, ten to fourteen oval, subequal in length to each other; antennal ratio about 1. Legs almost entirely white, coxæ brown; fourth tarsal segments of all legs flat; claws slightly unequal, each with a minute sharp tooth at base; proportional lengths of segments 21:22:8:4:2.5:2:3.5 in forelegs; 27:24:11:5:5:3.5:2.3:4 in hind leg. Wings (Plate 1, fig. 12) with veins colorless; two radial cells distinct. Halteres white. Abdomen white on anterior segments, brown on posterior segments, with lateral sides dark.

Holotype.—Female; Takasiba, Wakayama-ken; April 10, 1934.

Paratopotypes.—Female; April 10, 1934.

This species is distinctive in the distribution of macrotrichia of the wing and in the characteristic coloration of the abdomen.

CERATOPOGON (ISOHELEA) MINIMUS Kieffer.

This minute midge was found on the flowers of umbelliferous plants.

Female.—Body 1.1 mm long, black in general color. Mesothoracic scutum mat, with black setæ. Halteres with knobs white. Leg with coxæ, trochanters, and femora dark brown; tibiæ and tarsi yellowish white. Wings each with a small, dark, central cloud covering distal part of radial vein; two radial cells absent.

Head dark, eyes pubescent; frontoclypeus with only two pairs of small setæ. Antennæ with scapes and setæ black; flagellar segments pale brown; antennal ratio about 1.1. Maxillary palpi (Plate 3, fig. 49) pale brown; segment three with a large sensory pore, sensillæ of the pore not visible externally. Legs with relative length of segments 80:84:30:18:11:8:15 in foreleg; 95:92:47:22:13:9:15 in middle leg; 95:85:45:18:13:9:15 in hind leg; claws long, slender, arcuated, each with two basal trichoid teeth; empodium vestigial. Wings (Plate 1, fig. 15) hyaline, each with a dark central cloud covering radial end. Abdomen extensively yellow; tergal plates small, black; sternal plates highly reduced into very small paired sclerites which are brown on anterior five segments and black on remaining segments; cerci pale brown.

Specimens.—Female; Kamikoti, Nagano-ken; July 13, 1932.

CERATOPOGON (ISOHELEA) FLAVIVENTRIS Kieffer.

This is a minute midge, only 1 mm long.

Male.—Head and thorax dark brown. Halteres white. Wings with veins pale brown, two radial cells obliterated. Twelfth antennal segment longer than ultimate segment. Antennæ, mouth parts, and legs pale brownish yellow.

Antennal ratio about 0.8; proportional lengths of distal three segments 22:5:17:21. Legs with fourth tarsal segments cylindrical; hind legs with proportional lengths of segments 15:15:7.8:4:2.8:2:2.4. Wings (Plate 1, fig. 14) with radial cells obliterated; fMCu under base of first radial cell. Abdomen almost entirely pale brown; posterior segments including hypopygium dark brown.

Specimens.—Male; Sizyukei, Formosa; December 29, 1934.

CERATOPOGON (ISOHELEA) FALCIFER sp. nov.

Male.—Body about 1.5 mm long, almost entirely black. Thorax black, shiny. Wings white, with squama bare and dark; two radial cells subequal in length, very short; R_1 subequal to r-m. Halteres dark. Abdomen also black. Hypopygium with sickle-shaped styles.

Head with eyes pubescent. Antennæ including plumose hairs dark; antennal ratio about 0.83; proportional lengths of distal six segments 14:13:13.5:41:28:33. Legs black, with second and third tarsal segments somewhat paler; claws simple, curved only at extreme tip; pulvilli absent; empodium small; proportional lengths of segments of hind leg 24:22:10:6.5:4:2.5:2.7. Wings white, with main veins pale brown. Venation: costa ending just beyond middle of wing, radial cells equally very short, R_1 subequal to r-m, fMCu under base of second radial cell, M_2 atrophied on basal third or more. Abdomen dark; hypopygium with large, flat, anal points; coxites thick, subspherical; styles (Plate 3, fig. 45) large, sicklelike, angulated on distal third, bare and pointed on distal half.

Holotype.—Male; Toyohara, Sakhalin; July 31, 1938.

This species is very characteristic in the structure of the male style and the very short radial branches, in which it differs notably from other known species of the subgenus.

CERATOPOGON (ISOHELEA) ALBITARSIS sp. nov.

Female.—Body about 1.4 mm long, extensively dark brown. Wings with radial cells brown; first radial cell small; second radial cell obliterated; M_2 atrophied narrowly only on basal part. Claws slightly unequal, each with a sharp basal tooth.

Head and thorax dark brown. Antennæ with scapes dark brown; flagellum brown; segments two to four spherical, following five segments short and cylindrical, ultimate five segments elongated and cylindrical; antennal ratio about 1.22. Thoracic notum slightly shiny; scutellum with only four setæ. Legs with coxæ, trochanters, femora, and tibiæ dark brown, proximal four tarsal segments white but pale brown at tip, first tarsal segment of hind leg brown, fifth tarsal segments pale brown; relative lengths of segments of foreleg 20:19:7:3:2.3:1.8:3.8; those of hind leg 23:21:11:3.5:2.7:2:4. Wings (Plate 1, fig. 13) with radial cells brown; first radial cell small but distinct; second cell obscure; M_2 atrophied narrowly on basal part; r-m comparatively long, as long as R_1 . Halteres dark brown. Abdomen with tergal side yellowish pale brown.

Holotype.—Female; Kibune, Kyoto; July 10, 1932.

Paratopotypes.—Females; July 10, 1932.

This species is somewhat related to *C. flaviventris* Kieffer, but distinctly different in the coloration of the legs, halteres, and wing veins, and in the shape of the radial cells.

CERATOPOGON (ISOHELEA) MONTICOLUS sp. nov.

This species was collected on the flowers of umbelliferous plants.

Male.—Body about 1 to 1.2 mm long. Mesothoracic scutum brown, slightly shiny with two lateral vittæ reddish brown; humeral pits small and yellow. Wings without first radial cell, second radial cell small but distinct; R_1 and R_{4+5} completely fused, forming a long stem of second radial cell; R_{4+5} ending somewhat squarely, a faint, small, brown cloud covering second radial cell.

Head with frontal tubercles before antennal bases; eyes pubescent with minute hairs. Antennæ pale brownish white, with scapes brown; proportional lengths of distal nine segments 8: 8.5: 8.5: 9: 9: 9: 29: 22: 29; antennal ratio 1.26 to 1.53. Maxillary palpi (Plate 3, fig. 48) pale yellowish white; segment three with a sensory pore consisting of short spoonlike sensillæ. Thorax extensively brown, with setæ yellow; scutum slightly shiny, with humeral pits yellow, lateral vittæ reddish brown; membranous areas pale brown. Legs mainly yellowish white, with coxæ brown, femora yellowish pale brown; claws simple; empodium small, with two apical setæ; proportional lengths of segments 24: 24: 11: 5: 3: 2: 4 in foreleg; 26: 26: 12: 5: 3: 2: 4 in middle leg; 26: 24: 10: 5: 3: 3: 2: 4 in hind leg. Wing (Plate 1, fig. 16) with a faint, small, brown cloud covering second radial cell; veins mainly yellow; second radial cell small but distinct, and with a long stem formed by fusion of R_1 and R_{4+5} ; M_2 atrophied on proximal and distal parts. Halteres white. Abdomen white on anterior four or five segments and brown on other segments; hypopygium yellowish brown, styles (Plate 3, fig. 50) slender, slightly arcuated, bare on apical third; slender, each with a single seta at tip.

Holotype.—Male; Tokugo-toge, Nagano-ken; July 18, 1932.

Paratopotypes.—Males; July 18, 1932.

This species is related to *C. minimus* Kieffer, but the vein R_{4+5} ends squarely and the second radial cell is clearly different from those in related species. Another allied species may be *C. sociabilis* Goetghebuer, in which, however, the wing is provided with two distinct radial cells.

CERATOPOGON (ISOHELEA) BASIFLAGELLATUS sp. nov.

This species is very minute, being only 0.8 to 0.9 mm in the male and 0.7 to 0.8 in the female. Both sexes were found on the flowers of umbelliferous plants.

Male.—Thorax entirely reddish brown, mat, with hairs yellow. Wings with two distinct radial cells.

Head reddish brown; mouth parts and antennal flagellar segments yellowish white. Spoonlike sensillæ of sensory pore of maxillary palpus invisible externally. Antennal ratio about 0.63; proportional lengths of distal six antennal segments about 8:8:7:25:21:26. Legs with coxæ reddish brown, trochanters, femora, and tibiæ brown, tarsi white; proportional lengths of tarsal segments of foreleg 38:23:17:10:12; those of hind leg 48:23:18:9:13. Halteres brown on stem, white on knob. Wings (Plate 2, fig. 18) with two radial cells distinct, veins yellow. Abdominal terga of anterior five segments yellowish brown, those of other segments brown; hypopygium brown; styles (Plate 3, fig. 47) almost straight, slightly curved only at distal end, bare on distal tip.

Female.—Thoracic sclerites yellowish brown, membranous areas yellow; scutum slightly shiny; scutellum with only four setæ. Antennæ with scapes yellowish brown, other segments yellowish white. Wings without M_2 , two radial cells slitlike.

Head without frontal tubercles, eyes very finely pubescent. Antennæ 14-segmented, last segmentation incomplete; proportional lengths of distal seven antennal segments 6:6:8:9:12:10:11; antennal ratio about 1.1. Maxillary palpi each with a sensory pore consisting of several spoonlike sensillæ. Legs with coxæ yellowish brown, femora yellow, tibiæ pale yellow, tarsi white; claws very slightly unequal; proportional lengths of tarsal segments of forelegs 25:13:11:8:14; of hind legs 38:15:12:9:15. Wings (Plate 2, fig. 17) with two slitlike radial cells, M_2 completely atrophied. Halteres as in male.

Holotype.—Male; Hokugo-toge, Nagano-ken; July 18, 1932.

Allotopotype.—Female; July 18, 1932.

Paratopotypes.—Male and females; July 18, 1932.

This species is somewhat related to *C. sociabilis* Goetghebuer, in which, however, the wing of the female is provided with vein M_2 .

ATRICHOPOGON (ATRICHOPOGON) MINIMUS Kieffer.

Female.—Body length 1.3 to 1.4 mm. Head dark brown. Thorax brown; scutum brown or black, more or less shiny, with shoulder parts white, three vittæ brown and confluent; scutellum

yellow. Antennal ratio about 1.6. Wing with macrotrichia very sparse, spread only on distal end of cells R_5 and M_1 ; relative lengths of first and second radial cells 6.5:16, those of R_1 and R_{4+5} 7.5:22.

Head dark brown on vertex, whitish brown on frontal aspect. Antennæ brown; segments two to nine discoidal or spherical; segment ten fully as long as preceding two segments taken together; relative lengths of five distal elongated segments 21:23:25:25:38. Thoracic sclerites extensively brown; pleural and sternal sclerites yellowish brown. Legs with coxæ brown, other segments yellowish pale brown; proportional lengths of segments of hind leg 28:26:15:5:4:3:4. Wings (Plate 1, fig. 1) with macrotrichia very sparse, spread only on distal end. Halteres pale brown, yellow, or white. Abdomen pale brown or brown.

Specimens.—Females; Kagi and Sizyukei, Formosa; December 28 and 29, 1934.

ATRICHOPOGON (ATRICHOPOGON) FEMORALIS sp. nov.

Female.—Body about 2.2 mm long. Thoracic notum including scutellum uniformly black, shiny; pleural and sternal sclerites dark brown. Femora of forelegs entirely yellow; those of middle and hind legs broadly black at middle and yellow on both ends. Antennal ratio about 2. Wings with macrotrichia very thick; bare areas along veins M_{3+4} , Cu_1 , Cu_2 , and 1A distinct; relative lengths of first and second radial cells 8:27.

Head entirely dark brown, mouth parts brown; eyes bare. Antennæ with spaces and basal half of segment two yellow, other parts of antennæ dark brown; segments two to nine spherical or subspherical, segments ten to fourteen elongated, cylindrical; segment ten shorter than preceding three segments put together (40:43). Mesoscutellum with two pairs of setæ. Legs with coxæ dark brown, trochanters yellow, femora of forelegs yellow, those of middle and hind legs yellow at both ends and broadly dark at middle, other segments yellow; empodium larger than claws; relative lengths of segments of legs 29:28:18:6:4:3:4 in foreleg; 34:35:20:6:5:3:4 in middle leg; and 37:36:22:9:6:3.5:4.2 in hind leg. Wings (Plate 1, fig. 2) yellow on basal area, with macrotrichia very thickly spread all over surface. Halteres with knobs white. Abdomen with tergal side all brown, sternal sclerites brown and subdivided into paired sclerites; cerci yellow.

Male.—Head and thorax almost entirely black, shiny. Antennæ with scapes and plume black; flagellum dark brown;

antennal ratio about 1.54; proportional lengths of distal four segments 44:76:58:74. Proportional lengths of segments of hind leg about 34:36:23:8.5:6:4:4.8. Wings with macrotrichia sparse, spread on apical part of cell R_5 and M_1 . Abdomen brown, caudal segments dark brown; ultimate tergum of abdomen almost circular; hypopygium with styles (Plate 2, fig. 29) hardly as long as coxites (36:44), entirely pubescent but without setæ, tapering, slightly arcuated, each with a small apical spine.

Holotype.—Female; Kitasirakawa, Kyoto; November 5, 1935.

Allotype.—Male; Uzumasa, Kyoto; October 29, 1934.

Paratypes.—Males and females; Kitasirakawa and Uzumasa, Kyoto; October 29, 1934, and November 5 and 31, 1935.

This species is somewhat allied to *A. insularis* Kieffer and *A. lucorum* Meigen, but easily distinguished by the characteristic coloration of the femora.

ATRICOPOGON (ATRICOPOGON) WINNERTZI Goetghebuer.

Female.—Body 1.7 to 2 mm long. Mesoscutum dark brown or black, shiny. Antennal ratio 2 to 2.2. Wings with macrotrichia dense, spread almost on entire surface; bare areas along veins distinct; relative lengths of first and second radial cells 6.8:24.

Head dark brown on vertex, brown on frontoclypeus. Maxillary palpi slender, segmented (13:17:26:16:17), each with a sensory pore on distal part of segment three, sensillæ of pore invisible externally. Antennæ with segments one and two yellow, other segments brown; elongated distal segments paler; relative lengths of distal eight segments about 13:13:14:41:43:44:46:59. Thorax dark brown; scutellum somewhat paler and with four long, brown setæ besides small hairs; pleural and sternal sclerites brown; membranous areas pale brown. Legs with coxæ brown, other segments pale brown, sometimes femora of middle and hind legs broadly brown at middle and yellow on apical fourth; proportional lengths of tarsal segments of forelegs 100:32:26:21:22; those of hind leg 131:50:35:23:24. Abdomen uniformly pale brown or yellowish pale brown; spermatheca only one, almost spherical, brown.

Specimens.—Females; Kibune, Kyoto; June 1, 1930, and October 16, 1932; Uzumasa, Kyoto; October 9, 1934.

ATRICOPOGON (ATRICOPOGON) ROSTRATUS Winnertz.

Female.—Body about 2.4 to 2.5 mm long. Proboscis about as long as vertical length of head capsule. Head and thorax

dark brown, mat, pubescent, with brown microtrichia; scutum with shoulder areas somewhat paler. Wings (Plate 1, fig. 3) with macrotrichia rather sparse; central and basal area broadly bare; bare areas along veins distinct; relative lengths of first and second radial cells about 11:31. Antennal ratio about 2.24.

Antennæ with scapes yellowish brown, other segments brown; segments two to nine distinctly transverse; segment ten longer than preceding three segments taken together; relative lengths of distal five segments 43:43:46:46:60. Mesoscutellum brown. Legs with coxæ dark brown, tarsi brown, other segments pale brown; relative lengths of segments 36:37:24:7:6:4:5 in foreleg; 47:45:28:10:5.5:4.5:5 in hind leg. Halteres white. Abdomen with lateral sides broadly dark brown, tergal side pale brown.

Male.—Proboscis about as long as vertical length of head capsule. Thorax black, mat; scutellum with four black setæ. Wings without macrotrichia; relative lengths of two radial cells about 7:23, those of R_1 and R_{4+5} about 10:30. Antennal ratio about 1; relative length of distal four antennal segments about 30:62:54:68. Halteres white. Legs red; proportional lengths of segments of hind leg about 45:43:27:10.5:7:4.5:5. Abdomen black; hypopygium without anal points; styles (Plate 2, fig. 26) slender, almost straight, each with a small preapical point.

Specimens.—Males and females; Uzumasa, Kyoto; October 9, 1934, and Toyohara, Sakhalin; August 6, 1938.

ATRICOPOGON (ATRICOPOGON) FLAVENS sp. nov.

Male.—Body about 2.2 mm long. Head and thorax yellow; mesoscutum slightly shiny. Antennal ratio about 1.12. Wings with macrotrichia very scanty, spread on distal part of cells R_5 and M_1 ; relative lengths of two radial cells about 7:20.

Antennæ with scapes yellow, flagellum white or yellowish white, plumose hairs yellow; relative lengths of distal four segments 29:69:54:59. Scutum with two yellowish, pale-brown, lateral vittæ; scutellum pale brownish yellow. Legs with coxæ yellow, other segments white, distal ends of fore tibiæ dark; proportional lengths of segments 29:29:18:5.5:4.5:3:4 in foreleg; 37:36:23:8:6:4:4 in hind leg. Wings (Plate 1, fig. 4) with macrotrichia on veins M_1 and M_2 and distal part of cells R_5 and M_1 . Halteres white. Abdomen including hypopygium white, posterior segments somewhat yellowish; styles

of hypopygium (Plate 2, fig. 28) arcuated, each with a minute preapical spine on base of apical spine.

Holotype.—Male; Arasiyama, Kyoto; May 19, 1930.

Paratopotypes.—Males; May 19 and 25, 1930.

This species is somewhat allied to *A. albiscapula* Kieffer, in which, however, segment twelve of the male antenna is shorter than segment fourteen, and the mesoscutum is brownish with three dark-brown vittæ.

ATRICHOPOGON (ATRICHOPOGON) MARGINIPILUS sp. nov.

Male.—Body about 2 mm long; coloration closely as in *A. flavens* Tokunaga. Mesoscutum with three pale-brown vittæ. Antennæ including plumose hairs white; antennal ratio about 1.1. Proboscis long, almost as long as vertical length of head capsule. Wings (Plate 1, fig. 5) with macrotrichia only along distal margin of cell R_5 ; cell M_1 with only about three macrotrichia at anterior distal corner; relative lengths of two radial cells about 7:16. Relative lengths of ultimate four antennal segments 30:51:45:59. Scutum with three pale-brown vittæ, mat; scutellum white; postscutellum pale brown; other sclerites yellow. Proportional lengths of segments of hind leg 33:32:18:7:5.5:3.5:3.5. Halteres white. Abdomen white; posterior segments pale brown; hypopygium white, closely as in *A. flavens*.

Female.—Proboscis almost as long as head. Antennæ with scapes yellow, flagellum pale brown; segments two to nine transverse; segment ten longer than preceding three segments put together; antennal ratio about 2.8. Thorax brown, mat; scutum with three brown vittæ separated by pale lines; scutellum yellow. Legs including coxæ yellowish white; proportional lengths of segments of hind leg 38:38:20:8:5:3.8:4. Wings much as in *A. winnertzi* Goetghebuer; proportional lengths of two radial cells 7.25. Halteres white.

Holotype.—Male; Kibune, Kyoto; June 1, 1930.

Allotype.—Female; Daisen, Tottori; July 2, 1931.

Paratypes.—Males and females; Daisen, Tottori; July 2, 1931.

This species is closely allied to *A. flavens* Tokunaga, but provided with a long proboscis and three separate thoracic vittæ.

ATRICHOPOGON (ATRICHOPOGON) PARVIFORCEPS sp. nov.

Male and female.—Body 1.5 to 1.7 mm long. Thoracic notum entirely reddish brown, slightly shiny. Legs mainly yellow,

knee joints white. Wings of male without macrotrichia; those of female with only about three macrotrichia along distal margin of cell R_5 . Halteres white.

Head with eyes bare, proboscis yellowish brown, far shorter than vertical length of head. Antennæ of male mainly brown, scapes black, antennal ratio about 1; antennæ of female entirely brown, antennal ratio about 2.2; proportional lengths of distal six antennal segments of male 12:13:16:33:33:45; those of distal eight segments of female 7.5:7.5:7.8:22.5:-24:25:27:37; tenth antennal segment of female subequal in length to preceding three segments taken together; short basal flagellar segments of female transverse or spherical. Legs with coxæ brown, other segments yellow, knee joints white; empodium large; claws each with a small preapical tooth; proportional lengths of hind legs 25:22:13:4.5:3.5:2.5:2.5 in male; 23:21:11:4:2.7:2.5:2.6 in female. Wings with distinct radial intercalary fork; fMCu under middle of first radial cell; macrotrichia absent in male, very scanty and almost absent in female, only about three setæ along margin of cell R_5 ; relative lengths of veins R_1 and R_{4+5} about 6.5:16 in male and 7.5:20 in female; those of first and second radial cells about 5:12 in male and 6:13.5 in female; veins R_1 and R_{4+5} suddenly curved cephalad at end. Halteres white. Abdomen including hypopygium yellowish brown; styles (Plate 2, fig. 27) small, slender, about half as long as coxites, tip blunt.

Holotype.—Male; Toyohara, Sakhalin; July 31, 1938.

Allotopotype.—Female; July 31, 1938.

Paratopotypes.—Males and females; July 31, 1938.

This species is closely allied to *A. minutus* Meigen, in which, however, the female wing carries numerous macrotrichia between the intercalary forks, and the proportional lengths of two radial cells are about 1:2 in the male and 1:3 in the female.

ATRICHOPOGON (ATRICHOPOGON) EZOENSIS sp. nov.

Male.—Body about 2.2 mm long. Mesoscutum shiny, with three black vittæ separated by pale lines. Wings without macrotrichia. Halteres brown.

Antennæ including plume brown; antennal ratio about 0.86; proportional lengths of distal six segments 20:20:27:47:-39:50. Thorax black; scutellum brown. Legs dark brown. Wings without macrotrichia; fork of M_{1+2} atrophied; relative lengths of two radial cells about 7:16.5, those of R_1 and R_{4+5} about 9.5:23.5. Abdomen with tergal plates brown; hypopy-

gium with styles (Plate 4, fig. 95) slightly shorter than coxites, thickened at base, slightly arcuated.

Holotype.—Male; Beguntan, Hokkaido; July 7, 1936.

This species is closely allied to *A. minutus* Meigen, in which, however, the knobs of the halteres are white, the legs are yellow, and the second radial cell of the wing is only twice as long as the first radial cell.

ATRICHOPOGON (KEMPPIA) LONGISERRA Kieffer.

Female.—Body about 2.1 mm long. Coloration similar to that of *A. brunnipes* Meigen. Antennal ratio about 1.5. Wings with macrotrichia scanty and distributed only on distal part of cells R_5 , M_1 , and M_2 .

Mesothoracic scutellum yellow. Legs yellowish brown. Halteres white. Abdomen pale brown. Antennal segments three to seven transverse; segment ten equal in length to preceding two segments taken together; proportional lengths of distal five antennal segments about 27:27:33:34:50. Wings (Plate 1, fig. 6) with macrotrichia scanty, spread only on distal area; relative lengths of two radial cells about 11.5:23.

Specimens.—Female; Simogamo, Kyoto; March 7, 1930.

ATRICHOPOGON (KEMPPIA) BRUNNIPES Meigen.

Male.—Body about 2 mm long. Mesothoracic scutum mat black. Legs brown or yellowish brown. Halteres white. Antennal ratio 0.9 to 0.97. Wings without macrotrichia; relative lengths of two radial cells 1:2.62 to 1:2.91.

Head, thorax, antennal scapes, and coxæ of legs entirely black; antennal flagellar segments and abdominal terga dark brown or brown; legs except coxæ brown or yellowish brown. Proportional lengths of five ultimate antennal segments 22:34:54:49:69. Hypopygium with ultimate tergum round, without markings; styles (Plate 2, fig. 40) sharply pointed, almost as long as coxites.

Female.—Coloration closely similar to that of male, but scutum somewhat paler; humeral areas of scutum and scutellum pale brown; caudoscuteal area with a pair of pale-brown spots; scutal vittæ black, confluent. Legs and abdomen pale brown. Antennal ratio 1.75 to 1.68. Wings with macrotrichia rather scanty.

Proportional lengths of distal five antennal segments about 36:34:39:45:60; segments two to nine oval and short; segment ten shorter than preceding three segments put together. Legs with proportional lengths of segments 29:29:19:5:4:3:3.5 in fore-

leg; 38: 37: 20: 7.5: 5: 4: 4.5 in hind leg. Wings (Plate 1, fig. 7) with macrotrichia on marginal area; anal cell sometimes without macrotrichia; proportional lengths of two radial cells 1: 3 to 1: 3.85.

Specimens.—Males and females; Kibune, Kyoto; June 12 and November 23, 1932, and November 3, 1934; Uzumasa, Kyoto; October 29, 1934; Tsuta, Aomori-ken, October 14, 1935.

ATRICHOPOGON (KEMPPIA) KAGIENSIS sp. nov.

Male.—Body about 1 mm long. Head, thorax, and abdomen yellow; legs, halteres, and hypopygium white; mouth parts yellowish white; antennæ with scapes yellowish brown, flagellar segments and plume yellowish white. Wings without macrotrichia; relative lengths of two radial cells about 20: 60, those of R_1 and R_{4+5} about 30: 85; all veins hyaline and difficult to distinguish against the membrane.

Antenna with terminal stylet round; antennal ratio about 0.9; proportional lengths of distal five segments 8: 11: 31: 28: 37. Hind leg with relative lengths of segments 21: 20: 11: 4: 3: 2.5: 3. Hypopygium with ultimate tergum round: coxites slender; styles (Plate 2, fig. 39) slightly arcuated, pubescent, sharply pointed.

Holotype.—Male; Kagi, Formosa; December 28, 1934.

Paratopotypes.—Males; December 28, 1934.

This species is characteristic in the yellow coloration and in possession of a very long second radial cell which is about thrice as long as the first radial cell, and in the round apical stylet of the antenna.

ATRICHOPOGON (KEMPPIA) MARITIMUS sp. nov.

This midge was found in a small cave of a rocky seashore just above the high-tide mark.

Male.—Body about 1.5 mm long. Thorax yellow, mat. Antennæ with plumose hairs rather scanty. Wings without macrotrichia; relative lengths of two radial cells about 5: 10.

Head, mesoscutellum, legs, and abdomen all yellowish white; halteres white; mesoscutum yellow, with white lines along foveæ. Antennæ with scapes and plumose hairs yellowish brown, flagellar segments white; antennal ratio about 1.25; proportional lengths of distal six segments 8: 8: 15: 35: 35: 42. Legs entirely yellowish white; relative lengths of segments of hind leg 28: 24: 13: 4.7: 4: 3: 3.8. Hypopygium white; ultimate tergum produced caudad, oval; styles (Plate 2, fig. 34) long, fully as

long as coxites, straight, sharply pointed, pubescent only on basal part.

Female.—Coloration much as in male, but thorax sometimes brown, abdominal terga pale brown, antennæ yellowish white, and trochanters and femora white. Antennal ratio about 1.63; segment ten as long as preceding two segments put together; proportional lengths of distal five segments of antenna 20:24:-26:27:40. Claws of legs (Plate 2, fig. 32) flattened and strongly angulated; proportional lengths of segments of hind legs, 28:24:13:5:3.5:3:3.8. Wings (Plate 1, fig. 8) with macrotrichia scanty, spread on distal area of cells R_5 , M_1 , M_2 , and M_4 , second radial cell about thrice as long as first radial cell.

Holotype.—Male; Azako, Mie-ken; August 8, 1934.

Allotopotype.—Female; August 8, 1934.

Paratypes.—Males and females; Toba and Azako, Mie-ken; August 6 and 8, 1934.

This species is quite distinctive in the structure of the male hypopygium and of the female claws.

ATRICHOPOGON (KEMPIA) MONTICOLUS sp. nov.

Female.—Body 2 to 2.3 mm long. Thorax black, shiny. Antennal ratio about 1.46. Wings with macrotrichia rather scanty; second radial cell very long, about four times as long as first radial cell.

Head and thorax black. Antennæ dark brown; terminal stylet very long, sharply pointed; segments two to nine oval; segment ten as long as preceding two segments taken together; proportional lengths of ultimate seven segments 18:20:38:40:40:-41:63. Legs mainly yellow, coxal bases and femoral and tibial distal ends all brown; proportional lengths of segments of hind legs 41:42:23:9.5:6:4:4.5. Wings with macrotrichia rather scanty, distributed as in *A. maritimus* Tokunaga but more numerous; relative lengths of R_1 and R_{4+5} about 11.5:38. Halteres white. Abdomen extensively brown, caudal end white.

Holotype.—Female; Arisan, Formosa; December 27, 1934.

Paratopotypes.—Females; December 27, 1934.

This species is allied to *A. citrinipes* Kieffer and *A. hæmorrhoidalis* Kieffer. In the former the antennal ratio is about 2, and the tenth antennal segment is subequal in length to the preceding three segments put together. In the latter, the scape of the antenna is yellow, the ultimate antennal segment is about twice that of segment ten, and the wing vein R_{4+5} is twice as long as R_1 .

ATRICHOPOGON (KEMPPIA) YOSHIMURAI sp. nov.

Male and female.—Body about 2 mm long. Thoracic notum mainly dark brown in male and brown in female, not shiny; shoulder parts of male scutum brown; scutellum pale brown. Halteres yellowish white. Wings of male without macrotrichia, those of female with macrotrichia rather scanty, closely resembling those in *A. monticolus* Tokunaga, but anal cell with only several macrotrichia. Legs with coxæ and trochanters yellowish white; femora brown, but basal third of male legs and half of female legs brown; other segments all brown.

Antennæ dark brown; plume of male brown; antennal ratio about 1 in male and 1.56 in female; proportional lengths of ultimate four antennal segments 28:40:37:51 in male and 29:33:33:50 in female; segment ten of female equal in length to segment eleven or to preceding two segments put together. Proportional lengths of segments of hind legs about 34.5:33:19:5:6:5:3.5:4.5. Relative lengths of two radial wing cells about 7:14 in male and 9:24 in female. Abdomen brown. Male hypopygium with styles (Plate 2, fig. 38) very thick, terminating in a strong spine.

Holotype.—Male; Kitasirakawa, Kyoto; July, 1934.

Allotopotype.—Female; July, 1934.

This species is somewhat related to *A. brunnipes* Meigen and *A. monticolus* Tokunaga.

ATRICHOPOGON (KEMPPIA) JAPONICUS sp. nov.

Female.—Body about 1.5 mm long. Thoracic scutum black, very shiny. Eyes sparsely pubescent, very small. Antennal segments seven to nine very short, discoidal. Wings short, oval, without macrotrichia; vein R_{4+5} very thick; first radial cell slit-like.

Head and thorax dark brown. Antennæ with scapes dark brown; flagellum brown; antennal ratio about 1.95; segment ten shorter than preceding three segments put together; proportional lengths of distal five segments about 22:25:27:29:40. Legs with coxæ brown, other segments pale brown; proportional lengths of segments of legs 18:19:11:3:3:2:3 in foreleg; 23:22:11:4:3.5:2.8:3 in hind leg. Wings (Plate 1, fig. 9) without macrotrichia; relative lengths of two radial cells about 4.5:15. Halteres yellow. Abdominal terga uniformly brown.

Holotype.—Female; Kitasirakawa, Kyoto; July, 1934.

Paratopotypes.—Females; July, 1934.

This species is somewhat allied to *A. hæsitans* Kieffer, but the thoracic scutum is not mat.

ATRICHOPOGON (KEMPPIA) SPINIVENTRIS sp. nov.

Male.—Body about 1.6 mm long. Wings without macrotrichia. Antennal ratio about 1.

Head brown, eyes sparsely pubescent. Thorax brown, not shiny; scutum with pale line along foveæ; scutellum pale brown. Antennæ with scapes brown, flagellar segments pale brown, plumose hairs yellow; proportional lengths of distal four antennal segments about 22:44:41:51. Legs with coxæ brown, other segments white; relative lengths of segments of hind leg 30:-29:15:5:4:3:4. Wings without macrotrichia; M_{1+2} about as long as r-m; relative lengths of two radial cells about 7.5:14. Halteres white. Abdomen white; coxites short, thick; styles (Plate 2, fig. 36) large, as long as coxites, simple.

Female.—Head, thorax, and abdomen dark brown; scutum mat; scutellum brown; antennæ with scapes dark brown, flagellar segments brown; legs brown; proportional lengths of segments of hind leg 31:29:16:6:4:3:3. Antennal ratio about 1.4; relative lengths of five distal segments of antenna about 25:-24:22:24:35. Wings with macrotrichia thick, spread all over surface; bare lines along veins distinct; relative lengths of two radial cells about 8:18. Halteres white. Abdomen dark brown, with two pairs of strong spinelike appendages (Plate 2, fig. 30).

Holotype.—Female; Kibune, Kyoto; August 17, 1932.

Allotopotype.—Male; August 17, 1932.

Paratypes.—Males and females; Hatizyo and Kubune, Kyoto; May 25, 1930, and August 17, 1932.

This species is characteristic in the distribution of macrotrichia of the female wing and in the structure of the ventral abdominal processes of the female.

ATRICHOPOGON (KEMPPIA) DORSALIS sp. nov.

Female.—Body 1.4 to 1.7 mm long. Head and thorax brown or dark brown; scutum shiny, dark brown, with shoulder parts and areas of foveæ pale brown. Wings closely similar to those of *A. brunnipes* Meigen in the distribution of macrotrichia and in the venation.

Antennæ with scapes dark brown, flagellar segments pale brown; antennal ratio 1.93 to 2.1; segments three to nine discoidal; proportional lengths of ultimate five segments 30:33:-33:37:48. Legs pale brown; proportional lengths of segments of hind leg 35:34:17:6:4.5:3.4. Wings similar to *A. brun-*

nipes Meigen; relative lengths of two radial cells 1.3 to 3.6; in some specimens first radial cell very narrow and slitlike, and vein M_1 bent under intercalary radial fork. Halteres yellowish brown. Abdomen extensively yellowish brown; dorsal side with a pair of brown lateral stripes.

Holotype.—Female; Uzumasa, Kyoto; October 29, 1934.

Paratypes.—Females; Kibune and Uzumasa, Kyoto; May 30, 1930, and October 29, 1934.

This species is related to *A. brunnipes* Meigen, but the antennal ratio is larger, segments eleven and twelve are equal in length, and the abdominal dorsal side is not uniformly pale brown.

ATRICHOPOGON (KEMPJA) AKISUKII sp. nov.

Male.—Body about 2 mm long. Head and thorax dark brown; scutum slightly shiny, brown along foveæ, with humeral areas pale brown; caudoscuteal area with a pair of yellowish-white spots. Wings yellowish brown, without macrotrichia; proportional lengths of two radial cells about 7:11; those of R_1 and R_{4+5} about 9:17.

Eyes uniformly pubescent, contiguous above. Antennæ with scapes dark brown, flagellar segments and plumose hairs brown; antennal ratio about 0.88; total length of ultimate four segments equal to total length of basal segments two to nine; proportional lengths of ultimate seven segments 16:17:16:26:34:30:40. Mesothoracic scutellum brown. Legs with coxæ dark brown, other segments brown; empodium longer than claws; proportional lengths of segments of hind leg 31:28:12:4.5:4:2.5:4. Wing venation: fMCu under distal end of first radial cell, vein M_1 atrophied at base. Knob of haltere yellowish white. Abdomen extensively brown; terga dark brown; styles (Plate 3, fig. 51) of hypopygium as long as coxites, thickened on basal two-thirds, slightly curved on apical third, with chitinized ridge on distal part.

Holotype.—Male; Sikuka, Sakhalin; July 18, 1938.

Paratopotype.—Male; July 18, 1938.

This species is allied to *A. hæsitans* Kieffer, *A. infuscus* Goetghebuer, and *A. fuscus* Winnertz. But in the first allied species the pubescence of the eyes is sparse and short; in the second, the total length of the ultimate four segments of the antenna is shorter than the total length of segments two to nine; (47:53); in the third, the proportional lengths of the ultimate four antennal segments are 13:20:15:17, the total length of

the ultimate four segments of the antenna is greater than that of segments two to nine, and the relative lengths of the two radial cells is 1:2 to 3.

ATRICHOPOGON (KEMPPIA) CLAVIFUSCUS sp. nov.

Male.—Body about 2 mm long. Head and thorax black; mesothoracic scutum shiny; abdomen dark brown. Antennal ratio about 0.86. Wings without macrotrichia; second radial cell twice as long as first radial cell.

Antennæ pale yellowish brown, plume yellow; proportional lengths of ultimate five segments 20:33:50:43:50. Legs extensively pale yellowish brown; tibiæ, tarsi, and both ends of femora yellowish white; proportional lengths of segments of hind leg 40:41:24:8:6.5:4:4.5. Halteres white. Styles (Plate 2, fig. 37) of hypopygium sharply pointed, thick at base, slightly arcuated.

Female.—Body about 1.5 mm, almost entirely dark brown; scutum mat, pubescent with yellow hairs; shoulder parts brown. Halteres dark brown. Wings with macrotrichia as in *A. brun-nipes* Meigen; first radial cell about half of second radial cell in length. Antennal ratio about 1.4.

Antennal segments two to nine discoidal; following five segments oval, about 20:23:23:23:34.5 in relative length; tenth segment slightly shorter than preceding two segments put together. Legs dark brown; proportional lengths of segments 23:23:14:4:4:3:3 in foreleg; 30:27:15:5:4:3.5:3:5 in hind leg. Abdomen brown, with tergal plates dark brown.

Holotype.—Male; Arasiyama, Kyoto; October 2, 1930.

Allotype.—Female; Uzumasa, Kyoto; October 11, 1934.

This species is related to *A. fuscus* Winnertz and *A. infuscus* Goetghebuer, in the former of which, however, the female has the antennal ratio 2.45, the thoracic scutum shiny, the scutellum yellowish, the legs yellow, the first radial cell only one-third as long as the second cell, and the macrotrichia absent in M_4 and anal cell. In the latter the female has the antennal ratio 1.86 and the halteres white, and the male has the legs dark brown.

ATRICHOPOGON (KEMPPIA) KYOTOENSIS sp. nov.

Male.—Body about 2.2 mm long, almost entirely black; thoracic scutum slightly shiny. Wings without macrotrichia; relative lengths of two radial cells about 6:20. Antennal ratio about 1.1.

Antennæ with scapes black, flagellar segments dark brown; relative lengths of distal seven segments about 24:23:22:34:51:48:66. Legs with coxæ black, other segments dark brown; proportional lengths of segments 29:29:20:6:4:3.7:4 in fore-leg; 39:38:23:9:5.5:3.5:4.5 in hind leg. Halteres white. Abdominal terga brown; styles (Plate 3, fig. 46) of hypopygium as long as coxites, slender, sharply pointed, slightly arcuated. Wing with M_{1+2} very short, only about one-third of r-m.

Holotype.—Male; Kitasirakawa, Kyoto; November 5, 1935.

Paratopotypes.—Males; November 5, 1935.

This species is closely allied to *A. brunripes* Meigen, in which, however, the second radial cell is longer than two and a half times the first cell, the bare apical area of the style of the hypopygium is shorter, and vein M_{1+2} is longer than in the present species.

ATRICHOPOGON (KEMPPIA) PILOSIPENNIS sp. nov.

Male and female.—Body 1.5 to 1.9 mm long in male and 1.8 to 2 mm in female. Thoracic scutum dark brown, with three vittæ black and shiny. Halteres yellowish white in female and brown in male. Wings brown, with macrotrichia; in female (Plate 1, fig. 10) macrotrichia spread all over surface and in male (Plate 1, fig. 11) macrotrichia very scanty and distributed only on distal part of cells R_5 , M_1 , and M_2 . Antennal ratio about 1.67 in female and 0.77 in male.

Antennæ with scapes dark brown, flagellar segments brown; proportional lengths of distal six segments 12.5:27:29:31:31:43 in female; 18:18:22:37:37:51 in male. Mesothoracic scutellum brown, with four long setæ. Legs brown. Female wing with thick macrotrichia, bare areas along veins distinct; male wing with very scanty macrotrichia; relative lengths of two radial cells about 12:25 in female, 8:18 in male. Abdomen extensively yellow, with sternal and tergal plates pale brown. Male hypopygium brown, with coxites slender, very long; styles (Plate 2, fig. 33) slender, about half as long as coxites, with three apical spines. Abdominal ventral processes of female (Plate 2, fig. 31) highly chitinized; ninth sternum with one pair of serrulated projections; eighth sternum with three pairs of characteristic projections; spermatheca only one, dark brown, spherical.

Holotype.—Male; Kibune, Kyoto; October 16, 1934.

Allotopotype.—Female; October 16, 1934.

Paratopotypes.—Males and females; October 16 and November 3, 1934.

This species is somewhat allied to *A. pavidus* Kieffer, in which, however, the macrotrichia of the female wing are more scanty, the basal third of cells M_1 and M_2 are bare, the female antennal ratio is 1.3, segment twelve of the male antenna is longer than segment thirteen, and the tarsal segments of the male legs are paler than the other segments.

ATRICOPOGON (KEMP) FLAVISCUTELLUM sp. nov.

Male.—Body 2.4 to 2.5 mm long. Mesothoracic scutum black, mat, sometimes with paler lines along foveæ; scutellum yellowish white. Second radial wing cell shorter than twice first cell. Antennal ratio 0.9 to 1.

Antennæ with scapes black, flagellar segments and plume dark brown or brown; proportional lengths of distal six segments about 18.5:18.5:31:44.5:38.5:55.5. Legs brown. Wings without macrotrichia; relative lengths of two radial cells 8.5 to 9.5:13 to 16. Halteres pale brown. Hypopygium similar to that of *A. clavifuscus* Tokunaga.

Holotype.—Male; Kitasirakawa, Kyoto; October 15, 1937.

Paratypes.—Males; Wati, Kyoto; May 17, 1936.

This species is closely related to *A. clavifuscus* Tokunaga, but the scutellum is much paler, the scutum is not shiny, and the second radial wing cell is shorter than twice the first.

JOHANNSENOMYIA SHIBUYAI sp. nov.

Male.—Body about 3 mm long, almost entirely black, with yellow markings. Femora yellow, black on distal end of fore femur and on distal third of middle and hind femora; tibiæ black, broadly brown at middle. Abdomen largely black, extensively yellow on second tergum.

Head black. Antennæ with scapes black, flagellar segments brown; antennal ratio about 0.73; proportional lengths of distal six segments 4:4.1:6.5:8.5:11.8:14.5. Legs without femoral spines; fore coxa dark brown, mesal side yellow, other coxæ entirely dark brown; trochanters yellow; fore femur yellow, distal end narrowly black; other femora yellow on basal two-thirds and black on distal third; fore tibia black, middle part broadly brown, other tibiæ entirely black; tarsal segments one to four pale brown or white, distal ends of these segments and ultimate tarsal segments black; claws simple, equal; pulvilli absent; proportional lengths of segments of hind leg about 68:60:30:17:8:5:10. Wings (Plate 2, fig. 23) yellow on

basal area, broadly gray on distal area beyond crossvein and on anal margin; veins brown, without macrotrichia. Halteres dark brown. Abdomen extensively black; first tergum with a white spot on anterior margin; second tergum extensively yellow, with a narrow dark band on posterior margin; first and second sterna yellow. Hypopygium (Plate 3, fig. 43) with coxites elongated; styles small, curved.

Female.—Body 4 mm long; coloration similar to that of male. Middle and hind femora black at distal end, each with a narrow dark preapical ring; ultimate tarsal segment with sixteen strong ventral bristles. Antennal ratio about 1.34.

Head yellow in frontal aspect. Maxillary palpi yellow on proximal segments and dark brown on distal two segments. Antennæ with scapes dark brown; second segments yellow basally and black distally; following five segments with gradually increasing dark area distally; other seven segments entirely black, about 4.7: 4.7: 9.8: 10: 10: 11.5: 14 in proportional length. Thorax without scutal spine, bristles, and humeral pits. Legs without femoral spines. Fore coxa yellow, partially yellow at tip; fore femur as in male, middle and hind femora yellow, black at end and each with a narrow preapical dark ring; fore and middle tibiæ black, brown at middle; hind tibia entirely black; proximal two tarsal segments yellowish white, black at tip; following two segments brown; last segments black; in hind leg fourth tarsal segment as in preceding segments in coloration; proportional lengths of segments 55: 53: 20: 10: 5: 4: 13.5 in foreleg; 90: 83: 44: 21: 9: 5: 13.5 in hind leg. Proportional lengths of two radial wing cells about 20: 55. Abdominal coloration similar to that of male; terga three to eight dark brown, very narrowly white at caudal margin; tergum nine dark brown; sterna of segments one and two white, those of following five segments yellowish brown; spermathecae two, very unequal, both oval and black.

Holotype.—Male; Ikeda, Osaka; May 17, 1935.

Allotopotype.—Female; May 21, 1935.

Paratopotypes.—Males and females; May 17 and 21, 1935.

This species is related to *J. setigera* Loew and *J. nitida* Macquart, in the former of which the ultimate antennal segment of the male is thrice as long as segment twelve, the tibiæ of all legs and the hind tarsi are uniformly black; the antennal ratio in the female is less than 1, and the second tarsal segments of all legs are entirely black. In the latter the middle and hind femora of the female are broadly black distally and the total

length of the proximal two tarsal segments of the hind leg is subequal in length to the tibia.

STILOBEZZIA MONTICOLA sp. nov.

Male.—Body about 2.2 mm long, yellowish white. Wings unmarked, with macrotrichia only on distal area. Legs entirely yellowish white. Abdomen uniformly white or yellowish white.

Eyes very narrowly separated above. Antennæ with scapes yellow; flagellar segments white, with brown plume; antennal ratio about 0.84; proportional lengths of distal eight segments 19:20:21:23:26:56:76:65. Thoracic scutum with yellow vittæ, beset with dark setæ; scutellum with eight black setæ; other parts all yellowish white. Legs uniformly yellowish white or white; middle and hind tibiæ with rather long setæ on dorsal side; proximal three tarsal segments of foreleg each with an apical spine; those of middle legs each with two apical spines; those of hind legs without apical spines; first tarsal segment of middle leg with a basal spine; claws simple, each with a long basal seta; proportional lengths of segments of legs 38:36:22:12:4:3:5 in foreleg; 49:47:28:12.5:5:3:5 in middle leg; and 45:46:25:13:5:3:6 in hind leg. Wing without colored markings; macrotrichia present on distal areas of cells R_5 and M_1 , sometimes absent in cell M_1 . Venation: second radial cell long, about two and a half times the length of first cell, M_{1+2} long, longer than r-m, fMCu under r-m, M_{3+4} ending just before or at level of tip of R_{4+5} . Halteres yellowish white. Abdomen entirely yellowish white or white; terga highly setigerous with yellow slender hairs; hypopygium (Plate 4, fig. 93) closely resembling that of *S. lutacea* Edwards, but styles stouter and entirely pubescent, parameres simple and not bifid at tip, and chitinized parts all yellow.

Female.—Antennæ yellowish white; antennal ratio about 1.1; proportional lengths of distal eight segments about 26:30:39:48:51:52:50:62. Legs each with only one simple claw; fourth tarsal segment cylindrical; proportional lengths of segments of hind leg about 50:50:27:13:4.5:4:7.5. Wings (Plate 4, fig. 91) with macrotrichia somewhat thicker than in male, on distal area of cells R_1 , M_1 , and M_2 . Other characters as in male.

Holotype.—Male; Mount Daisen, Tottori-ken; July 2, 1931.

Allotype.—Female; Kibune, Kyoto; May 30, 1930.

Paratype.—Male; Mount Daisen, Tottori-ken; July 2, 1931.

This species is allied to *S. seror* Johannsen and *S. lutacea* Edwards. In the former the male wing is quite bare, and in the latter the hypopygium is different.

STILOBEZZIA ALBICORNIS Kieffer.

Female.—Body about 1.7 mm long; wings about 1.6 mm long. Thorax entirely black, shiny. Hind leg with a pale ring before and beyond knee joint; fifth tarsal segments of all legs each with two strong bristles on ventral side. Wings unmarked, held divergent at an angle of about 45° at rest.

Head yellow, eyes slightly separated above; proboscis pale brown; maxillary palpi dark brown. Antennæ with scapes yellow, segments two to nine white, following five segments pale brown. Legs mainly yellowish white; knee joints and distal tips of tibiæ of middle and hind legs dark; hind femur broadly dark at middle, with a white preapical ring; hind tibiæ also broadly dark at middle, with a white ring before and beyond ends; fourth tarsal segments cordiform; fifth tarsal segments (Plate 2, fig. 35) cylindrical, each with a pair of strong black basal bristles and a pair of slender apical setæ on ventral side; claws very unequal, simple, longer claw twice as long as shorter. Wings (Plate 4, fig. 89) unmarked, without macrotrichia; second radial cell about four times as long as first; fMCu beyond r-m. Haltere with stem yellowish white; knob yellowish white on ventral side and apical half of dorsal side, brown on basal half of dorsal side. Abdominal terga black and shiny, tergum one greenish white with a pair of black spots.

Specimen.—Female; Hatizyo, Kyoto; June 30, 1938.

STILOBEZZIA NOTATA de Meijere.

Stilobezzia decora KIEFFER, Ann. Mus. Nat. Hung. 14 (1916) 89, 90; Ann. Soc. Linn. Lyon 68 (1922) 159.

Male.—Body 1.5 to 2.8 mm long, yellowish white. Wings with small dark clouds. Abdominal terga with dark markings.

Antennæ bicolorous, yellowish white on basal and distal third and brown on middle third; antennal ratio about 0.9; proportional lengths of distal eight segments 25:25:27:28:35:78:90:141. Thorax shiny, with dark-brown setæ; scutum brown along lateral and anterior margins; postscutellum white on anterior half and dark brown on posterior half; sternepisternum and epimeron brown. Legs white, knee joints of middle and hind legs dark brown; tibial ends of these legs also dark brown; first tarsal segment of middle leg with a basal and two apical spurlike bristles; second tarsal segments of same leg with two

apical bristles; other legs without tarsal spurs; third tarsal segment somewhat flat; fourth segment cordiform; claws bifid at tip; in some specimens distal half of first tarsal segments, following four segments of fore- and middle legs, and all tarsal segments of hind legs pale brown. Wings with two small clouds at base, a cloud covering r-m, two clouds in cell R_5 , faint clouds covering M_1 , M_2 , M_{3+4} , Cu_1 , Cu_2 , 1A, and a furrow in cell M_2 . Venation: second radial cell about thrice as long as first, fork of M_{1+2} under middle of second radial cell, fMCu under base of second radial cell. Halteres with stems white, knobs brown. Abdominal terga one to three white, those of other segments yellow in ground color; in some specimens posterior segments including hypopygium yellowish brown; terga four to six each with two pairs of brown spots, terga three to seven each with a pair of brown spots. Hypopygium (Plate 4, fig. 92) with coxites swollen mesad at base; styles entirely pubescent, pointed at tip.

Female.—Body about 2.2 mm long. Coloration somewhat different from that in male.

Head brownish yellow on vertex, yellow on frontal side. Eyes separated by a narrow line. Mouth parts brown. Antennæ yellow; antennal ratio about 1.5; proportional lengths of distal eight segments 22:22:24:49:56:56:58:82. Thorax yellow; scutum with yellow median vittæ which are surrounded by brown rings, and lateral vittæ which are dark brown at posterior end; caudoscuteal area and scutal lateral margins somewhat brown; postscutellum with a pair of yellowish-brown clouds; pleural side with a broad, oblique, brown band which arises from base of wing and ends at ventral ridge of fore-coxal articulation. Legs extensively yellow; in middle and hind legs femora dark brown on distal two-fifths and each with a distinct yellow preapical ring, tibiæ dark brown at end and each with a dark-brown ring beyond base; third and fourth tarsal segments of all legs brown and flattened; fifth tarsal segments of fore and middle legs each with a pair of strong ventral bristles on basal part and a single claw that is provided with a large basal tooth. Wings (Plate 4, fig. 90) with second radial cell very large, about four times as long as first; fork of M_{1+2} far before middle of second radial cell. Abdomen yellow, with dark-brown tergal markings: terga of segments two and three each with three dark spots, those of segments five, six, and seven each with two smaller dark spots, terga four dark brown, with two pairs of yellow spots; cerci round.

Specimens.—Males and females; Hatizyo, Kyoto; March 23 and May 25, 1930; Seto, Wakayama-ken; August 23, 1930; Kagi, Formosa; December 28, 1934.

DICROBEZZIA SUGIYAMAI sp. nov.

Female.—Body about 3.5 mm long, black, shiny. Costa of wing slightly produced beyond end of R_{4+5} . Legs with femora and tibiae black. Abdomen white, with black spots.

Head black on vertex, yellowish brown on frontal aspect; maxillary palpi pale yellow. Antennae with scapes yellowish brown, short flagellar segments white, long distal segments dark; antennal ratio about 1.43; proportional lengths of distal nine segments 25:25:27:34:64:66:65:64:77. Thorax entirely black, shiny, with many strong setae. Coxae of fore- and middle legs black, those of hind legs reddish yellow on basal half and white on distal half; trochanters yellowish brown; femora mainly black, yellowish brown on basal part; tibiae black, each with a small yellowish-brown ring beyond basal end; tarsi extensively white, brown on ultimate segments; ultimate tarsal segment with many (11 to 15) ventral bristles; apical tarsal spurlike bristles present only on first tarsal segment of middle leg; claws each with a basal tooth, basal tooth of one claw larger than that of other claws. Proportional lengths of segments of legs 60:58:24:9:4:3:14 in foreleg; 73:57:28:9:4:3.5:11 in middle leg; and 82:68:35:13:6:4:11 in hind leg. Wings (Plate 4, fig. 88) with main veins pale brown, costa slightly produced beyond end of R_{4+5} , R_1 slightly sinuous, R_{4+5} about thrice as long as R_1 . Halteres white. Abdomen white; terga three to five with transverse black spots.

Holotype.—Female; Uzumasa, Kyoto; July 9, 1936.

This species is allied to *D. venusta* Meigen, but the coloration of the legs is notably different.

CHIRONOMIDÆ

TANYPODINÆ

PROCLADIUS (PROCLADIUS) KARAHUTOENSIS sp. nov.

Male and female.—Body 3.5 to 4 mm long. Coloration much as in *P. nipponicus* Tokunaga. Male antennal ratio about 2.2. Styles of male hypopygium small, without basal lobes. Legs without beards.

Male antennal ratio about 2.2; female antennae fourteen-segmented. Thorax almost entirely black; pronotum yellow, with dark clouds; scutum with shiny black vittae, humeral areas of

female yellow; areas along foveæ dusted with gray, caudoscuteal area with a pair of small pruinose spots. Wings yellow on basal area, dark on distal half and anal area, each with a central dark spot covering r-m; macrotrichia thickly spread all over surface; veins dark brown; mediocubital ratio 0.75 to 0.8. Halteres yellow. Styles of male hypopygium (Plate 3, fig. 44) small, without trace of basal lobes.

Holotype.—Male; Sikuka, Sakhalin; July 15, 1938.

Allotopotype.—Female; July 15, 1938.

Paratopotypes.—Male and females; July 15, 1938.

This species is very closely allied to *P. nipponicus* Tokunaga, which differs from it in the following points: the style of the male hypopygium is provided with a blunt basal lobe, and the male antennal ratio is at most 1.9.

PENTANEURA CIRCUMDATA sp. nov.

Female.—Body 1.5 to 2.7 mm long. Thoracic mesonotum white, with three yellow scutal vittæ, lateral vittæ dark around margin. Femora white, each with a dark apical ring. Wing with two large dark bands. Abdomen with dark-brown tergal bands on anterior margins of segment.

Antennæ 12-segmented; proportional lengths of distal five segments about 18:18:18:20:50; antennal ratio about 2.58. Thoracic scutum white, with three yellow vittæ, median vitta subdivided and with dark clouds on anterior and posterior ends, each lateral vitta provided with a dark marginal ring; scutellum white; postnotum dark brown; pleural sclerites yellowish brown; sternal side white. Legs including coxæ white; femora each with a dark apical ring. Halteres white. Wings (Plate 2, fig. 24) with two dark, broad bands, proximal band incomplete at vein 1A and covering r-m; distal band complete, arising from distal ends of R_1 and R_{2+3} and ends on Cu_1 , distal end of wing dark; fork of R_{2+3} complete, costa not produced beyond tip of R_{4+5} . Abdominal segments two to six each with a dark-brown band on anterior margin of tergum and white on posterior part; segment one entirely white; tergum seven entirely dark brown.

Holotype.—Female; Sizyukei, Formosa; December 29, 1934.

Paratopotypes.—Females; December 29, 1934.

This species is allied to *P. maculipennis* Zetterstedt, but the vertex of the head is not dark, the lateral scutal vittæ are not provided with black spots at the caudal end, the distance between the tips of M_{1+2} and R_{4+5} is greater than that between the

tips of M_{1+2} and M_{3+4} ; these two distances are subequal in the allied species, and the basal band of the wing is far broader.

PENTANEURA PLEURALIS sp. nov.

Male and female.—Body 1.3 to 1.5 mm long. Male antennæ 15-segmented; antennal ratio about 1. Female antennæ 12-segmented; antennal ratio about 0.25; proportional lengths of distal five segments about 13:13:14:14:35. Thorax extensively yellowish white; scutum with three yellow vittæ on yellowish-white ground color, median vitta subdivided, with dark small clouds, lateral vittæ each with a dark stripe on lateral margin; postnotum dark brown; either pleural side with a distinct, oval, dark-brown spot on central part. Legs white, femoral tip somewhat dark. Wing (Plate 2, fig. 25) with a dark band just beyond r-m; costa not produced beyond tip of R_{4+5} ; fork of R_{2+3} complete. Abdominal segments three, four, six, and seven entirely dark brown; segment one with a pair of brown clouds on lateral sides; tergum two yellow, with a narrow brown band on anterior margin; terga five, eight, and nine entirely yellow. Male hypopygium with styles (Plate 3, fig. 52) very slender, slightly arcuated, pubescent and setigerous on basal two-thirds, bare on distal third.

Holotype.—Male; Sizyukei, Formosa; December 29, 1934.

Allotopotype.—Female; December 29, 1934.

Paratopotypes.—Females; December 29, 1934.

This species is quite distinctive in the possession of a dark-brown central pleural spot and a dark band on the wing.

ORTHOCLADINÆ

METRIOCNEMUS (METRIOCNEMUS) PICIPES Meigen.

Male.—Body about 3 mm long, entirely black. Antennal ratio 2.5 to 3. Thorax black, with black setæ. Wings with squama black, main veins black, macrotrichia spread all over surface but rather scanty on basal half, bare area along R_{4+5} ; costa produced beyond tip of R_{4+5} as long as r-m; R_{2+3} extending parallel to R_1 ; wing membrane white. Halteres black. Male hypopygium with anal point small; coxites without lobes, styles slender, without distinct ridge.

Specimens.—Males; Sikuka, Sakhalin; July 21, 1938.

CRICOTOPUS NITENS (Kieffer).

Trichocladius nitens KIEFFER, Philip. Journ. Sci. 18 (1921) 576, 577.

Male.—Body about 2.5 mm long. Thorax yellow, with three dark scutal vittæ. Abdominal terga of segments one and seven

entirely yellow; tergum two with a pair of dark spots on anterior margin; tergum four with a narrow dark band on anterior margin; terga five and six dark on anterior two-thirds, yellow on posterior third; terga three, eight, and nine entirely dark.

Thorax almost entirely yellow; scutum with three black vittæ, caudoscuteal area with a brown cloud; postnotum black; pleural side with brown clouds. Coxæ, trochanters, and femora yellow; femoral end broadly dark; tibiæ white, with distal end broadly black; tarsi brown; no pulvilli. Wings with veins brown. Venation: costa a little produced beyond tip of R_{4+5} , R_{2+3} ending at middle between tips of R_1 and R_{4+5} , fMCu just beyond r-m, relative lengths of R_1 and R_{4+5} about 17: 37. Halteres white. Coxite of hypopygium with a small, bare, mesal lobe; styles swollen on apical part, without chitinized ridge (Plate 3, fig. 55).

Specimen.—Male; Taihoku, Formosa; August 28, 1937.

According to Kieffer, in the male the antennal ratio is slightly greater than 1 and the terga of abdominal segments five, six, and seven are entirely dark brown, while in the female segment seven is entirely yellow. This species was originally described by Kieffer as *Trichocladius nitens* from Taihoku and Daitotei, Formosa.

CRICOTOPUS TRIFASCIA Edwards.

Male and female.—Body 2.5 to 3 mm long, yellow in ground color. Thorax with four black vittæ on yellow scutum; scutellum and postscutellum black; abdomen yellow on segments one, four, and nine, black on other segments. Antennal ratio of male about 1.45. Legs mainly black; fore and middle tibiæ broadly pure white at middle; fore tarsal segments entirely black; no beards and pulvilli. Wings slightly milky white; costa produced beyond end of R_{4+5} , fMCu just beyond r-m, 1A extending far beyond fMCu. Second dark abdominal tergum of female with a yellow band on anterior part. Male hypopygium white; coxites without lobes; styles (Plate 3, fig. 56) each with a dorsal ridge.

Specimens.—Males and females; Titori, Sakhalin; August 3, 1938.

CRICOTOPUS TAIWANUS sp. nov.

Female.—Body about 1.8 mm long. Thoracic sclerites uniformly dark brown; scutum with three vittæ dark and subconfluent; pleural and sternal sclerites somewhat paler. Legs with pulvilli, color as in *C. nitens* (Kieffer); proportional lengths of segments of hind leg about 36: 43: 23: 12: 10: 5: 5. Antennæ

6-segmented (17: 24: 14: 15: 14: 38). Wings with veins yellowish brown; R_1 and R_{4+5} swollen; venation as in *C. nitens* but fMCu under r-m. Halteres white. Abdominal terga one and four yellow; terga three, eight, and nine black; terga two, five, and six dark and narrowly yellow on anterior margin; tergum seven yellow and narrowly dark on posterior margin.

Holotype.—Female; Sizyukei, Formosa; December 29, 1934.

This species is quite distinctive in the coloration of the thoracic and abdominal terga.

CRICOTOPUS TREMULUS Linnæus.

Male.—Body about 3 mm long, black in ground color. Thorax extensively black, only pronotum and humeral areas white. Legs with tibiæ and second and third tarsal segments white. Abdomen white on first two segments, black on other segments.

Antennal ratio about 1.5. Legs without beards and pulvilli, tibiæ of all legs black on basal end and apical third, white on basal two-thirds; second tarsal segments of all legs white; third tarsal segments of forelegs entirely white, those of middle and hind legs mainly white, black only on distal end; first, fourth, and fifth tarsal segments entirely black. Wings brown, costa slightly produced beyond tip of R_{4+5} . Dark abdominal segments somewhat paler on anterior margin. Hypopygium with tergum nine black, coxites each with a small, pubescent, setigerous, mesal lobe; styles flattened, each with a prominent preapical projection, ridges obscure (Plate 3, fig. 53).

Specimens.—Males; Toyohara, Sakhalin; July 31, 1938.

CRICOTOPUS BITUBERCULATUS sp. nov.

Male.—Body length about 3 mm. Thoracic coloration closely as in *C. trifascia* Edwards. First and second abdominal segments entirely yellow; following six segments mainly black, tergum three with a posterior, narrow, yellow band; tergum four with very narrow anterior and posterior yellow bands, tergum five with an anterior, narrow, yellow band. Coloration of legs also as in *C. trifascia*; no pulvilli.

Antennal ratio about 1.42. Wings with veins brown, R_{2+3} ending at middle between ends of R_1 and R_{4+5} , costa produced beyond end of R_{4+5} , fMCu slightly beyond r-m, 1A extending beyond fMCu. Hypopygium with tergum nine white; coxites each with two small setigerous tubercles on mesal side; styles suddenly thickened on distal two-thirds, with dorsal ridge (Plate 3, fig. 54).

Holotype.—Male; Titori, Sakhalin; August 31, 1938.

This species is somewhat related to *C. festivus* Meigen and *C. annulator* Goetghebuer, in the former of which, however, the dark mesoscutal vittæ are confluent and the second abdominal tergum is provided with a dark anterior band, and in the latter the mesoscutum is black except for yellow humeral areas, and the second abdominal tergum is provided with a narrow, faint, black band.

SPANIOTOMA (ORTHOCLADIUS) MULTIANNULATA sp. nov.

Male and female.—Body about 3.8 mm long. Thorax entirely black, shiny. Male antennal ratio about 2.44. Female antennæ moniliform, long, 11-segmented. Female cerci rhombic, pointed caudad.

Eyes bare, reniform. Antennæ dark brown, 11-segmented in female (15:30:23:23:23:23:22:22:21:23:45). Thorax black, shiny. Legs entirely dark brown, filiform; basal two tarsal segments with apical spurs; empodium very small; pulvilli absent; female claws simple, male claws slightly spatulate and serrulate at tip; proportional lengths of tarsal segments of hind leg about 67:33:24:14:9 in male and 65:32:24:12:8 in female. Wings with numerous microtrichia, yellowish pale brown on anterior cells C, Sc, R₁, and R₃. Venation: costa a little produced beyond tip of R₄₊₅, Cu₁ arcuated on distal half, 1A straight and far beyond fMCu, relative lengths of R₁ and R₄₊₅ about 55:105 to 55:110; anal lobe of male prominent, that of female round. Halteres white. Abdomen of male dark brown, each tergum with a narrow dark caudal band; that of female with sternal and tergal sides brown; male hypopygium without anal point, coxites each with a large swollen basal lobe on mesal side, styles (Plate 3, fig. 57) flat, each with a small apical ridge and a long black apical spine; cerci (Plate 3, fig. 63) white, rhombic, pointed caudad.

Holotype.—Male; Arisan, Formosa; December 27, 1934.

Allotopotype.—Female; December 27, 1934.

This species is highly characteristic in the structure of the female antennæ and in the shape of the female cerci.

SPANIOTOMA (LIMNOPHYES) FUSCIPYGMA sp. nov.

Male.—Body about 1.5 mm long. Thorax entirely brown, shiny, without scales; scutum with vittæ darker and confluent. Antennæ with very short ultimate segments. Legs without pulvilli; second and third tarsal segments of hind legs subequal in length. Ultimate tergum with a blunt, small, pubescent, anal point; styles slender, with dorsal ridge and apical spine.

Head with eyes bare and reniform. Antennæ 14-segmented but last segmentation incomplete; ultimate segment with long pubescence, shorter than preceding three segments taken together; plume rather scanty; antennal ratio only 0.14. Proportional lengths of segments of hind legs 28:31:16:5:8.5:8:3.5:4. Wings with distinct microtrichia; squama with only three setæ. Venation: costa produced beyond tip of R_{4+5} , R_{2+3} ending at middle between tips of R_1 and R_{4+5} , fMCu far beyond r-m, Cu_1 curved downwards, 1A ending before fMCu. Halteres brown. Abdomen uniformly brown; hypopygium with anal point small, blunt, pubescent; coxites each with a minute, blunt, mesal lobe; styles slender, each with a dorsal ridge and a long apical spine (Plate 3, fig. 59). Legs, antennæ, and mouth parts brown.

Holotype.—Male; Sizyukei, Formosa; December 29, 1934.

This species is somewhat allied to *S. minimus* Kieffer, in which, however, each coxite of the male hypopygium is provided with a large mesal lobe, and the antennal ratio is 0.6.

SPANIOTOMA (SMITTIA) TIPULIFORMIS sp. nov.

This species was collected along a stream at Mount Ari, Formosa.

Male.—Body about 3 mm long, brown in ground color. Legs, wings, and abdomen much elongated. Thorax with three shiny, brown vittæ on yellowish-brown scutum. Abdomen brown; abdominal terga each with a narrow dark band on caudal margin. Antennal ratio about 1, ultimate segment with forked long sensillæ at tip.

Head with eyes reniform, bare. Antennæ 14-segmented, with plumose hairs brown. Scutum yellowish brown, with three shiny, brown vittæ; scutellum yellowish brown; other sclerites uniformly brown. Legs very delicate, slender, without pulvilli; empodium vestigial; tarsal segments of hind legs showing proportional lengths 45:24:17:10:8. Wings milky white, purplish by transmitted light, without anal lobe, very long, about five times as long as wide, veins very delicate and colorless. Venation: costa distinctly produced beyond tip of R_{4+5} , M_{3+4} ending far before tip of R_{4+5} , fMCu under r-m, Cu_1 almost straight and slightly undulated at tip. Halteres yellowish brown. Abdomen brown, with narrow, tergal, brown bands. Hypopygium (Plate 3, fig. 58) with anal point very small, semicircular, bare; coxites each with a small basal tubercle and a large, flat ventral lobe; styles small, pointed, each with a small dorsal ridge on basal area.

Female.—Body 2 to 2.7 mm long, yellow. Mesothoracic scutum with three brown vittæ; postscutellum and pleural sclerites brownish yellow. Antennæ elongate, 7-segmented (17:40:28:-25:25:25:40), with very long trichoid sensillæ. Wings broader than in male; anal lobe obtuse. Abdomen yellow, each segment with a narrow, brown, tergal band on caudal margin; cerci with prominent ventral lobe.

Holotype.—Male; Arisan, Formosa; December 27, 1934.

Allotopotype.—Female; December 27, 1934.

Paratopotypes.—Males and female; December 27, 1934.

According to Edwards's system this species belongs to group A of *Smittia*, but vein Cu_1 is almost straight and is lightly sinuous only at tip. The *Tipula*-like appearance is quite characteristic of the species, greatly differentiating it from the brown species of the genus.

SPANIOTOMA (SMITTIA) ATERRIMA Meigen.

Male.—Thorax entirely black; scutum shiny. Abdomen dark brown. Head with eyes pubescent; antennæ black, with subapical bare area; antennal ratio 1.55 to 1.6. Legs without beards and pulvilli. Wings milky white. Venation: costa produced beyond end of R_{4+5} , the latter curved along costa on distal part and about twice R_1 , R_{2+3} ending near tip of R_{4+5} , fMCu far beyond r-m, Cu_1 undulated, 1A beyond fMCu, curved downwards at tip; veins colorless; squama not very black. Halteres dark brown. Male hypopygium with anal point small, bare; coxites each with a small mesal lobe; styles each with a prominent preapical ridge (Plate 3, fig. 62).

Specimens.—Males; Omu, Kitami, Hokkaido; August, 1937.

SPANIOTOMA (SMITTIA) VESPARUM Goetghebuer.

Male and female.—Body entirely black; scutum mat. Wings milky white. Male antennal ratio about 1.7 to 1.8. Female antennæ with leaflike sensory organs.

Eyes pubescent; ultimate segment of male antennæ pubescent on basal half of distal nonplumose area; female antennæ 6-segmented (2.5:3.5:2.7:3:3:6), flagellar segments (Plate 3, fig. 61) with leaflike sensillæ. Legs without pulvilli. Wings with anal lobe large; squama not very dark. Venation: costa produced beyond tip of R_{4+5} fMCu beyond r-m, Cu_1 sinuous, 1A extending beyond fMCu and curved at tip. Halteres dark brown. Male hypopygium with anal point small, pubescent, needlelike; coxites each with a bare small lobe; styles flattened, with small

preapical concavity, dorsal ridge developed only on apical part (Plate 3, fig. 60).

Specimens.—Males and females; Sikuka, Sakhalin; July 17, 1938.

CHIRONOMINÆ

PENTAPEDILUM (PENTAPEDILUM) TUBERCULATUS sp. nov.

Male.—Body about 3.8 mm long; ground color dark brown. Mesoscutum with three shiny black vittæ which are separated by pale-brown stripes along foveæ. Wings with macrotrichia only at extreme tip. Halteres brown. Dorsal appendages of hypopygium flattened apically, each with a seta; ventral appendages each with a setigerous dorsal tubercle on apical end. Antennal ratio about 1. Foreleg ratio about 1.25.

Head dark brown, with eyes bare and elongated dorsad; mouth parts and frontal area brown. Antennæ 14-segmented, brown, with scapes black. Scutum with three black vittæ, caudoscuteal area dark brown; scutellum brown; other sclerites black. Wings milky white, veins pale brown, anal lobe obtuse. Venation: R_{2+3} extending closely along R_1 , fMCu far beyond base R_{4+5} , 1A atrophied at fMCu; macrotrichia only at distal end of R_5 and closely along distal margin in cell M_2 . Legs mainly brown, coxæ black; pulvilli large; no beards on forelegs. Abdominal terga uniformly dark brown. Hypopygium with anal point slender, simple; styles short, oval, with distinct setæ on entire length of mesal side; dorsal appendages (Plate 3, fig. 70) nonpubescent, hyaline, dilated and flattened distally, each with a short seta; ventral appendages (Plate 3, fig. 64) straight, with strong setæ only on apical part, each with a characteristic setigerous tubercle on apical end.

Holotype.—Male; Kita-Hakutyo-ko, Karahuto; July 30, 1938.

Paratopotypes.—Males; July 30, 1938.

This species is highly distinct in the possession of the short terminal segments of the antennæ and the characteristic hypopygium.

PENTAPEDILUM (PHÆNOPSECTRA) KIZAKIENSIS sp. nov.

This species is very abundant in Kizaki-ko (Lake Kizaki), Nagano-Ken. The blood-red larvæ represent an important element in the benthal fauna of the lake. The immature stages have often been incorrectly reported in limnological papers as *Endochironomus* larvæ. The specimens examined were reared in the laboratory from the larvæ from the bottom of the lake.

Male and female.—Body about 4.5 to 5 mm long. Thorax and abdomen black, with white pruinescence. Legs brown. Male antennal ratio 2.3 to 2.4. Foreleg ratio 1.15 to 1.25.

Head without frontal tubercles; eyes bare. Antennæ of male 14-segmented, brown, scapes black; female antennæ 7-segmented (4:4.5:5:7:7:6.5:12). Mouth parts brown. Pronotum reduced, invisible in dorsal aspect. Legs with large pulvilli; forelegs of male with long beards. Wings mainly brown but somewhat yellowish on basal area, with macrotrichia rather thick on distal two-thirds, bare areas along veins distinct, veins brown. Venation: costa not produced beyond end of R_{4+5} , R_{2+3} extending very closely along R_1 , fMCu under r-m; r-m and base of Rs dark. Halteres pale brown. Abdomen black; caudal margins of segments with somewhat whitish pruinescence. Male hypopygium black, much related to that of *P. punctipes* Wiedeman, figured by Goetghebuer; and anal point as long as ventral appendages, extending just beyond end of coxite, simple, very slightly clavate at tip; dorsal appendages (Plate 3, fig. 74) elongated, curved only at tip; ventral appendages straight, with branched featherlike bristles on distal part; styles thick, not distinctly narrowed apically, with marginal fringe of setæ on mesal side not restricted at tip.

Holotype.—Male; Kizaki-ko, Nagano-ken; March 25, 1931.

Allotopotype.—Female; March 25, 1931.

Paratopotypes.—Male and female imagines, pupæ, and larvæ; March, 25, 1931.

This species is closely related to *P. punctipes* Wiedeman, in which, however, the thorax is shiny black, the abdomen is shiny pale green, the male antennæ including plumose hairs and the legs are uniformly white, and the antennal ratio of the male is about 2. Another related species may be *P. flavipes* Meigen, in which the legs and the styles of the male hypopygium are pale yellow, the female antennæ are 6-segmented, and the dorsal appendages of the male hypopygium are arcuated and not curved at the tip (Goetghebuer's figure).

CHIRONOMUS (CHIRONOMUS) THUMINI Kieffer.

The adult flies were reared by Mr. Y. Ito from the larvæ which were collected from a hot spring (33.8° C.) at Zigoku-onsen, Kumamoto-ken.

Male.—Body about 4.9 mm, wings about 3.4 mm long. Thorax entirely black, slightly pruinose; abdominal terga dark

brown. Antennal ratio 2.4 to 2.5. Head with frontal tubercles small but distinct; antennæ 12-segmented. Legs brown, without beards on forelegs. Hypopygium dark brown, almost as in *C. dorsalis* Meigen; ultimate tergum with only two median setæ before base of anal point; dorsal appendages narrowed basally.

Larva.—Body length of full-grown larvæ about 10.2 mm. Mentum much as in *C. dorsalis*, but four pairs of lateral teeth subequal in shape and size. Labrum with six pairs of slender, featherlike, lateral appendages and a pair of simple, trichoid dorsomedian appendages; ventromedian appendages flat, elongate, oval, finely serrulated only on one edge.

Specimens.—Males and larvæ; Zigoku-onsen, Kumamoto-ken; January 17, 1938.

The imagines are darker than the European specimens and seem to represent a dark variety of the species.

CHIRONOMUS (CHIRONOMUS) CIRCUMDATUS Kieffer.

Chironomus (Chironomus) circumdatus KIEFFER, Ann. Hist.-Nat. Mus. Nation. Hung. 14 (1916) 110, 111.

Male and female.—Body about 5 mm long, yellowish white in ground color. Thorax with three orange-yellow vittæ, lateral margins of these vittæ dark; broad, dark, marginal rings of these vittæ in female. Abdominal terga two to five each with a round dark central cloud, in female abdominal terga brown, each with a large dark-brown cloud. Legs pale yellow; base of fore tibia dark brown. Male antennal ratio 3.3 to 3.6. Foreleg ratio about 1.76. Wings with base of radial branches somewhat dark brown. Dorsal appendages of male hypopygium as in Plate 4, fig. 80.

Specimens.—Males and females; Taihoku, Formosa; August 12 to 18, and September 1, 1937.

CHIRONOMUS (CHIRONOMUS) PRASINELLUS Kieffer.

Chironomus (Chironomus) prasinellus KIEFFER, Suppl. Ent. 1 (1912) 37, 38.

Male and female.—Body about 4.5 mm long in male and 4 mm long in female, almost entirely yellow. Mesothoracic scutum with three orange-yellow vittæ. Legs yellowish white, articulations between tarsal segments dark. Wings each with a small, dark, central cloud covering r-m. Male antennal ratio 2.7 to 3.3. Dorsal appendages of male hypopygium closely resembling those in *C. circumdatus* Kieffer.

Specimens.—Males and females; Taihoku, Formosa; August 12 to 18 and September 1, 1937.

Kieffer incorrectly stated that the dorsal appendage of the male hypopygium bears a small, apical, spinelike projection.

CHIRONOMUS (CHIRONOMUS) DYSTENUS Kieffer.

Chironomus (Chironomus) dystenus KIEFFER, Ann. Hist.-Nat. Mus. Nation. Hung. 14 (1916) 112.

Male.—Body 3.7 to 5 mm long. Thoracic ground color brown; scutum with three vittæ black, shiny. Abdominal terga dark brown. Halteres brown. Legs uniformly brown. Wings with veins pale brown, r-m slightly darker. Male antennal ratio 2.8 to 2.9. Foreleg ratio about 2.

Specimens.—Males; Taihoku, Formosa; August 12 to 18 and September 1, 1937.

The dorsal appendages of the male hypopygium (Plate 4, fig. 79) are bare but each is provided with a flat setigerous basal lobe on the ventral side.

CHIRONOMUS (CHIRONOMUS) NIPPONENSIS sp. nov.

Male and female.—Body about 7 mm long, almost entirely black. Thorax with shiny, black, scutal vittæ which are sub-confluent or confluent. Legs brown, with dark markings, knee joints broadly black. Wings with r-m and base of R_{4+5} black. Halteres yellowish white. Male antennal ratio 1.45 to 1.6. Foreleg ratio 4.1 to 4.3. Male hypopygium with broad anal point which is provided with two dorsal lamellæ.

Head entirely dark brown, with frontal tubercles. Antennæ of female 6-segmented (5:11.3:9:9:7.5:14.9). Thorax almost black; scutum of female brownish black on caudoscuteal area and along foveæ. Legs largely brown; coxæ, knee joints, bases of femora, distal ends of tibiæ, and distal ends of proximal three tarsal segments uniformly black; ultimate two tarsal segments dark brown; beards of forelegs absent. Wings with veins dark brown; fMCu under r-m. Abdomen black; caudal margin of each abdominal tergum pale brown. Male hypopygium with anal point broad, large; styles with mesal long setæ only on distal part; dorsal appendages (Plate 4, fig. 81) black, long, slightly arcuated, pointed at tip; ventral appendages with bristles branched or forked.

Holotype.—Male; Sikuka, Karahuto; August 18, 1938.

Allotopotype.—Female; August 18, 1938.

Paratopotypes.—Males and females; August 18, 1938.

This species somewhat resembles *C. dorsalis* Meigen, but the structure of the anal point and the shape of the dorsal appendages are notably different.

CHIRONOMUS (CHIRONOMUS) TRINIGRIVITTATUS sp. nov.

Male and female.—Body 6 to 7 mm long. Thoracic notum yellow, with three separated black vittæ on yellow scutum; post-scutellum of male yellow, that of female orange yellow on anterior half and black on posterior half. Legs mainly yellow; fore tibiæ yellowish brown, tarsal segments of all legs brown. Wings with veins yellowish brown, stem of M, r-m and R₄₊₅ black. Male antennal ratio about 3.5. Foreleg ratio about 1.5.

Head with frontal tubercles. Male antennæ brown, with scapes black; female antennæ yellow, 6-segmented. Legs with pulvilli large; beards of forelegs absent. Mesoscutum shiny, yellow, with three black vittæ; scutellum yellow; pleural side with a large black spot; sternal side black. Halteres yellowish white. Abdomen uniformly brown; caudal margin of each tergum narrowly pale brown. Hypopygium closely resembling that in *C. dorsalis* Meigen (Plate 4, fig. 78).

Holotype.—Male; Sikuka, Sakhalin; July 18, 1938.

Allotopotype.—Female; July 18, 1938.

Paratopotypes.—Males and females; July 18, 1938.

This species is very closely allied to *C. dorsalis* Meigen, in which, however; the male antennal ratio is less than 3 and the foreleg ratio is greater than 1:5.

CHIRONOMUS (CHIRONOMUS) FLAVIPLUMUS sp. nov.

Males.—Body about 5.5 mm long, yellowish white in ground color. Thorax pruinose, with three orange-yellow scutal vittæ. Abdomen yellowish white on anterior segments, yellowish pale-brown on caudal segments; tergal side of abdominal segments two to four each with a small, oval, dark, central spot.

Head with frontal tubercles. Antennal ratio about 3.5; scape yellow, flagellum brown, plume pale brownish yellow. Thoracic ground color yellowish white; scutum with three orange-yellow vittæ; postscutellum white on anterior half, orange-yellow on posterior half; other sclerites uniformly yellow. Legs yellow, without beards; distal ends of tarsal segments dark; foreleg ratio about 1.65. Wings with veins pale yellow; r-m dark; fMCu under r-m. Halteres white. Hypopygium yellowish brown, very closely resembling that in *C. dorsalis* Meigen, styles somewhat narrower on apical part.

Holotype.—Male; Saga, Kyoto; August 18, 1937.

Paratopotypes.—Male; August 18, 1937.

This species is very closely allied to *C. dorsalis* Meigen, in which, however, the antennal ratio is 2.9.

CHIRONOMUS (MICROTENDIPES) FUSCIPENNIS Meigen.

Male.—Body about 5 mm long. Thorax shiny black, scutellum yellowish brown. Wings uniformly pale yellow. Halteres black. Legs yellow. Abdominal segments one to five yellow, six to nine black. Antennal ratio hardly greater than 1. Foreleg ratio about 1.4.

Head without frontal tubercles. Antennæ mainly brown, with scapes black. Legs yellow, coxæ dark brown, fore femora black on distal two-thirds, fore tibiæ narrowly black at tip; pulvilli present. Styles of hypopygium elongated; dorsal appendages (Plate 3, fig. 65) yellow, slender, clavate at tip, with a seta at middle; ventral appendages slender, with an apical seta.

Specimens.—Males; Titori, Karahuto; August 3, 1938.

CHIRONOMUS (MICROTENDIPES) KARAFUTONIS sp. nov.

Male and female.—Body 2.5 to 3 mm long, entirely white. Scutum with pale-yellow shiny vittæ. Male antennal ratio about 7. Foreleg ratio about 1.4. Male hypopygium with broad dorsal appendages.

Head without frontal tubercles. Antennæ yellow, those of female 6-segmented, those of male 14-segmented. Wings with only four squamal setæ, veins pale yellow; R_{2+3} extending very closely to R_1 ; R_{4+5} ending almost at tip of wing. Legs with very small pulvilli; no beards on forelegs. Male hypopygium with anal point simple, very slender; styles large, thick, with dorsal ridge on basal half; dorsal appendages (Plate 3, fig. 66) broad, each with two setæ; ventral appendages straight, with many bristles on distal part only.

Holotype.—Male; Toyohara, Sakhalin; August 6, 1938.

Allotopotype.—Female; August 6, 1938.

Paratopotypes.—Males; August 6, 1938.

This species is allied to *C. diffinis* Edwards, in which, however, the dorsal appendages of the male hypopygium are slenderer, the anterior five segments of the abdomen are green, the remaining segments dark, and the postscutellum and thoracic sternum black.

CHIRONOMUS (MICROTENDIPES) YAMASINENSIS sp. nov.

This species is very common along the drainage of Lake Biwa. The specimens examined were reared from the larvæ collected from the bottom of the drainage.

Male and female.—Body 4 to 6 mm long, yellowish brown in ground color, with white pruinescence. Male antennal ratio about 1.1. Male with long beards on forelegs; foreleg ratio 1.1 to 1.2. Abdominal tergum with three brown clouds on anterior part and two large pruinose areas on posterior part.

Head with eyes bare. Antennæ pale brown, scapes yellow; in female antennæ 6-segmented (5:12:8:8:7:13), intermediate flagellar segments each with a long neck region, ultimate segment with five preapical setæ. Thorax with three reddish-brown vittæ on scutum, broadly pruinose along foveæ, with a median dark-brown stripe on anterior half of scutum; scutellum yellowish brown; postscutellum brown on anterior half, yellowish brown on posterior half; other thoracic selerites yellowish brown. Legs yellow, with brown clouds; pulvilli present; coxæ yellowish brown; femoral base and tip, tibial distal end, and basal area beyond extreme base broadly brown; distal half of third tarsal segment and two distal segments of foreleg, distal half of proximal three tarsal segments, and two distal segments of middle and hind legs uniformly brown. Wings uniformly brown, veins yellowish brown; R_{2+3} extending closely along R_1 ; r-m dark brown in female and brown in male. Halteres yellow. Tergum of first abdominal segment with a pair of brown clouds; other segments with three brown clouds on tergal side; ultimate two segments of female entirely brown. Male hypopygium brown; anal point simple, needlelike, elongated, extending beyond coxites; styles swollen basally, narrowed on apical half, with long bristles on apical part; dorsal appendages (Plate 3, fig. 72) elongated, arcuated, with three setæ on middle part; ventral appendages (Plate 3, fig. 69) compressed, with three long setæ on apical end, strong bristles on entire length of dorsal side, and each with a dorsal setigerous tubercle on apical part.

Holotype.—Male; Yamashina, Kyoto; October 11, 1935.

Allotopotype.—Female; October 11, 1935.

Paratypes.—Males, and female imagines, pupæ, and larvæ; Yamashina and Kumano, Kyoto; October 11, 1935, and August 27, 1936.

This species is somewhat related to *C. confinis* Meigen, in which, however, the male antennal ratio is about 2, the abdominal terga two to five are each provided with a basal dark band, terga six to eight are entirely black, the anal point of the male hypopygium ends before the tip of the coxite, the styles

are oval and not distinctly narrowed apically, and the ventral appendages are normal, not compressed and not tuberculated.

CHIRONOMUS (POLYPEDILUM) NUBECULOSUS Meigen.

Male and female.—Body about 6 mm long in male and 4 mm long in female. Thorax shiny black. Wings with two dark clouds in cell R_5 . Male antennal ratio about 1. Foreleg ratio about 1.55.

Head black, appendages brown. Male antennæ 14-segmented; female antennæ yellow, 6-segmented (5:10:6.5:7:5:29). Thorax with pale stripes along foveæ. Legs mainly yellow, coxæ black; no distinct beards on forelegs. Wings with veins yellowish pale brown, with several dark clouds; one at base of cell R_5 , one beyond middle of cell R_5 which extends at tip R_{4+5} , one in cell M_1 , one faint cloud along caudal margin of vein M_{1+2} , two faint clouds in anal cell. Halteres dark brown. Abdomen black; anal point of male hypopygium needlelike; dorsal appendages (Plate 3, fig. 73) elongated, almost straight, curved only at tip, with a long seta; ventral appendages straight, with a long apical seta; styles elongated, oval.

Specimens.—Males and females; Azabu, Tokyo, and Toyohara, Karahuto; May 10, 1937, and July 31, 1938.

CHIRONOMUS (POLYPEDILUM) TRINIMACULUS sp. nov.

Male and female.—Body 2.7 to 3.5 mm long. Scutum shiny black, somewhat paler along foveæ; humeral areas yellowish brown. Wings each with three dark clouds: one in cell R_5 , one in cell M_4 , and one in anal cell. Male antennal ratio about 1.48. Foreleg ratio about 1.45.

Male antennæ 14-segmented; female antennæ 6-segmented (4:9:5.5:6.5:5:11). Thorax almost entirely black; scutum with black, shiny, subconfluent vittæ; scutellum yellowish brown. Legs with coxæ black; in male other segments all pale brown; in female tibiæ of forelegs, bases of femora of all legs, and tarsal segments of all legs yellowish pale brown, tibiæ of middle and hind legs and femora of all legs black. Wings (Plate 3, fig. 42) with three dark clouds: one in base of cell R_5 (in male extreme base of cell R_5), one in base of cell M_4 covering vein Cu_1 , and one at middle of anal cell; fMCu beyond r-m. Halteres pale brown in male and black in female. Abdominal terga uniformly dark.

Holotype.—Female; Toyohara, Sakhalin; August 5, 1938.

Allotopotype.—Male; August 5, 1938.

Paratypes.—Females; August 5, 1938.

The female of this species is closely related to *C. ægyptium* Kieffer, in which, however, the halteres are white in the female and the foreleg ratio is about 2. The male of this species is related to *C. flugidum* Kieffer, in which, however, the halteres and legs of the male are dark brown and the fork between veins M_{3+4} and Cu_1 is situated under r-m.

CHIRONOMUS (GLYPTOTENDIPES) PARIPES Edwards.

Male and female.—Body 6.5 to 7.5 mm long, black in ground color. Thorax black, heavily dusted with gray. Legs entirely black; forelegs with long beards; second and third tarsal segments of forelegs subequal in length. Abdominal segments with distinct tergal racket-shaped impression.

Head with small frontal tubercles, in female tubercles very small. Male antennal ratio about 4.6; female antennæ 7-segmented (5:5:6:7:7.5:8:14). Tarsal segments of forelegs with proportional lengths 122:58:55:49:24; foreleg ratio about 1.35. Wings white, with dark-brown veins; vein M_{1+2} dark brown on basal half, colorless on distal half; r-m and base of R_{4+5} black. Halteres pale brown. Abdomen black, caudal margin of each abdominal tergum heavily dusted with gray. Male hypopygium with anal point slender, long, clavate distally; styles elongated; dorsal appendages (Plate 4, fig. 77) elongated, strongly curved distally; ventral appendages straight, with simple bristles.

Specimens.—Males and females; Sikuka, Sakhalin; August 18, 1938.

The British specimens are somewhat different in the following points: the wings are strongly milky white and have vein M_{1+2} entirely pale as in Cu_1 and M_{3+4} , the male antennal ratio is only 4, and the foreleg ratio is 1.25.

CHIRONOMUS (GLYPTOTENDIPES) GRIPEKOVENI Kieffer.

Male and female.—Body 7 to 8 mm long. Scutum heavily pruinose, yellowish brown in ground color, with dark-brown vittæ. Legs mainly yellowish brown, knee joints dark. Male antennal ratio 3.35 to 3.42. Foreleg ratio 1.6 to 1.7.

Head without frontal tubercles. Female antennæ 7-segmented (5:7:6.5:7:7:6.5:12). Thorax heavily pruinose, yellowish brown in ground color; scutum with median vitta dark brown and lateral vittæ black; pronotum and scutellum brownish yellow; postscutellum black; pleural membranes yellowish brown.

Coxæ of middle and hind legs dark brown, those of forelegs yellowish brown; other segments extensively yellowish brown, knee parts broadly dark brown; knee articulations somewhat paler; femora and tibiæ of female darker than in male; tarsal segments dark at tip; ultimate two tarsal segments brown. Forelegs without beards, with proportional lengths of tarsal segments 128:60.3:54:46.3:20.7. Wings with veins uniformly dark brown, r-m not darker than other veins; R_{2+3} extending parallel to R_1 ; fMCu under r-m. Halteres pale brownish white. Abdomen with distinct, dorsal, segmental impression; tergal side dark brown, somewhat paler along posterior margin of each tergum. Male hypopygium (Plate 4, fig. 76) closely resembling that in *C. paripes* Edwards, but styles thicker and with larger dorsal ridge.

Specimens.—Males and females; Saga, Kyoto; August 18 and 19, 1937.

CHIRONOMUS (STICTOCHIRONOMUS) AKIZUKII sp. nov.

Male and female.—Body about 5 mm long, mainly black. Thorax black, pruinose along foveæ. Abdomen black; caudal margin of each abdominal tergum strongly pruinose. Legs with distinct black and yellow markings. Wings each with a black central spot covering r-m. Male antennal ratio about 2.5. Foreleg ratio about 1.4.

Head with eyes bare. Male antennæ entirely black, 14-segmented; female antennæ yellow, with two apical setæ, 6-segmented (4:8:6.5:7:7:12). Thorax black, with white pruinescence along foveæ; scutum with a small hump at middle. Legs with coxæ, trochanters, and femora mainly black; femora each with a narrow yellow ring before distal end; tibiæ broadly black on both ends, yellow on middle part, with a black ring at middle; basal three tarsal segments yellow, distal ends of these segments black; other tarsal segments uniformly brown; no beards on foreleg; pulvilli as long as claws. Wings with veins yellow, each with a distinct black central spot covering base of R_{4+5} and r-m; R_{2+3} ending slightly before middle between tips of R_1 and R_{4+5} ; fMCu just before r-m. Halteres yellowish white. Abdomen black, with white pruinescence on caudal margin of each tergum. Female cerci dark brown; male hypopygium mainly black, distal half of styles yellowish brown; dorsal appendages (Plate 3, fig. 71) black, strongly curved on apical part, each with a seta; ventral appendages straight, with

strong bristles almost on entire length of dorsal side and each with an apical long seta; styles elongated, subcylindrical, with many small hairs on apical half; anal point simple, long.

Holotype.—Male; Toyohara, Sakhalin; August 6, 1938.

Allotopotype.—Female, August 6, 1938.

Paratypes.—Males and females; Wakasugiyama, Hukuoka-ken; March 29 and 30, 1930; Wakayama, Wakayama-ken; March 20, 1935; Azabu, Tokyo; April 15, 1936; and Toyohara, Sakhalin; August 6, 1938.

This species is closely allied to *C. histrio* Fabricius, in which, however, the black tibial middle rings are only found on the hind legs, and the apical setæ of the ventral appendages of the male hypopygium are absent.

CHIRONOMUS (LIMNOCHIRONOMUS) LOBIGER Kieffer.

Male and female.—Body about 5 mm long in male and 4 mm long in female. Thorax with yellow vittæ on white scutum. Legs mainly yellow; fore tibiæ black; first tarsal segments of forelegs white, with distal third black. Halteres white. Antennal ratio of male 2.85. Foreleg ratio about 1.5.

Head with frontal tubercles; eyes bare. Antennæ yellowish pale brown, 12-segmented in male, 6-segmented in female. Thoracic sclerites mainly yellow; scutum with yellow vittæ separated by white stripes along foveæ; scutellum white. Legs mainly yellow; distal third of first tarsal segments and distal four tarsal segments all black; in foreleg, tibia black and basal two-thirds of first tarsal segment white; pulvilli large. Wings with veins all yellow; R_{2+3} extending along R_1 , fMCu just beyond r-m. Abdomen yellow. Male hypopygium (Plate 3, fig. 68) with anal point simple, long; styles strongly arcuated, slender, with setæ of mesal side only at distal end; dorsal appendages large, setigerous, somewhat swollen apically; ventral appendages very slender, strongly clavated and curved at distal end, with bristles only on apical part.

Specimens.—Males and females; Sikuka, Sakhalin; July 18, 1938.

According to Edwards the European specimens are somewhat different from our specimens in the following points: the fore femora are slightly darker apically, the dorsal appendages of the male hypopygium are much slenderer, forming beaklike projections at the end, and setigerous only at tip, and the ventral appendages are more or less conspicuously bilobed.

CHIRONOMUS (CRYPTOCHIRONOMUS) SAUTERI Kieffer.

Chironomus (Cryptochironomus) sauteri KIEFFER, Philip. Journ. Sci.
18 (1921) 583, 584.

Male and female.—Body about 2.5 mm long in male and 2 mm long in female, almost entirely yellow. Mesoscutum with three orange-yellow vittæ; postscutellum also orange-yellow, with a pair of dark clouds. Abdomen yellow, with caudal five segments yellowish pale brown. Legs yellow; forelegs with tibiæ and tarsi dark brown; first tarsal segment of foreleg broadly white on basal part. Wings with all veins hyaline, without dark cross-vein. Male antennal ratio 1.9 to 2.1. Foreleg ratio about 1.8.

Head without frontal tubercles. Male antennæ 12-segmented, scape dark, flagellum brown, plume yellowish white; female antennæ 6-segmented (15:26:14:14:16:44), ultimate segment subequal to preceding three segments together, intermediate flagellar segments without neck region, with long sensillæ. Wing with fork between M_{3+4} and Cu_1 beyond basis of radial branches. Male hypopygium with anal point long, slender, extending at middle of styles; styles slender, long, strongly arcuated; dorsal appendages (Plate 4, fig. 82) slender, straight, arising from end of coxite, each with three setæ on apical part.

Specimens.—Males and females; Taihoku, Formosa; August 12 to 18, 1937.

Kieffer has described only the female imago.

CHIRONOMUS (CRYPTOCHIRONOMUS) VIRIDULUS Fabricius.

Male.—Body about 3.5 mm long, yellow in ground color. Thoracic scutum with three black shiny vittæ; postscutellum reddish brown on anterior half and black on posterior half. Hypopygium with neither dorsal nor ventral appendages. Antennal ratio about 2.5. Foreleg ratio about 1.6.

Head with frontal tubercles very small. Antennæ brown, scapes black, 12-segmented. Scutum with three black vittæ and a small median hump; sternal side black; pleural side with a large black spot under base of wing. Legs mainly yellowish brown; forelegs brownish black; pulvilli large; empodium vestigial. Wings with veins yellowish brown; R_{2+3} extending parallel to R_1 , fMCu beyond r-m not darker. Halteres yellow. Abdomen brown on tergal side. Hypopygium with subtriangular broad anal point (Plate 3, fig. 75); styles slender, slightly arcuated, with ventral lamella, apical setæ only two.

Specimens.—Males; Sikuka, Sakhalin; July 18, 1938.

CHIRONOMUS (PROCHIRONOMUS) BIFASCIPENNIS sp. nov.

Male and female.—Body about 2 mm long in male and 1.5 mm long in female, dark brown in ground color. Wings each with two dark broad bands; squama bare. Male hypopygium with ventroproximal appendages.

Antennæ of male 14-segmented; antennal ratio about 0.91; those of female 6-segmented (14:30:19:19:18:30). Head, thorax, and abdomen dark brown; mesoscutum with subconfluent dark vittæ. Legs with coxæ dark brown, femora broadly dark on apical part, other segments white; fore tibiæ without spur; middle and hind tibiæ each with two confluent combs, each of which carries a spur; empodium vestigial; claws simple; beards of forelegs and pulvilli absent; foreleg ratio about 1.21. Wing (Plate 3, fig. 41) with two large dark bands, squama bare; cells R_1 and R_3 very narrow; veins brown, R_{2+3} and r-m obscure. Halteres white. Male hypopygium (Plate 3, fig. 67) white, anal point slender; dorsal appendages swollen and setigerous basally, pointed and curved apically; ventral appendages short, straight, with curved bristles on apical part; ventroproximal appendages with stem very short, each consisting of a tuft of simple setæ; styles normal, almost straight.

Holotype.—Male; Sizyukei, Formosa; December 29, 1934.

Allotopotype.—Female; December 29, 1934.

This species is very closely related in coloration to *Paratendipes nigrofasciatus* Kieffer which, however, is provided with a spur on the fore tibia, an important character of *Parathendipes*.

CHIRONOMUS (PROCHIRONOMUS) NIGERARTICULUS sp. nov.

Female.—Body about 2.7 mm long, almost entirely yellowish white. Fore tibiæ without spines; larger comb of hind tibia without spur, smaller comb with a long spur; pulvilli absent; third and fourth tarsal segments of foreleg subequal in length.

Head without frontal tubercles, with a small brown spot on vertex. Antennæ 6-segmented (17:38:25:28:31:49); intermediate flagellar segments each with a short neck region. Scutum with a small brown cloud on anterior margin, a larger brown cloud on either lateral margin; postnotum with a small brown cloud on posterior margin; pleural side with three small brown clouds under base of wing, sternal episternum with two small brown bands; pronotum much as in *Stenochironomus*. Legs white; knee joints, distal ends of tibiæ, and tarsal segments black; proportional lengths of segments of forelegs 62:54:71:

36:32:32:10; foreleg ratio about 1.31. Wings with veins pale yellow; squama fringed. Venation: R_{4+5} ending almost at tip of wing, R_{2+3} extending parallel to R_1 , r-m very short and obscure, fMCu far beyond r-m. Abdomen entirely yellowish white.

Holotype.—Female; Taihoku, Formosa; December 26, 1934.

Paratopotypes.—Females; December 26, 1934.

This species is somewhat allied to *C. formosanus* Kieffer, which, however, has the thorax provided with three reddish-brown vittæ, the foreleg ratio about 1.5, and the abdomen entirely reddish brown.

TANYTARSUS (TANYTARSUS) FORMOSANUS Kieffer.

Tanytarsus (Tanytarsus) formosanus KIEFFER, Suppl. Ent. 1 (1912) 42, 43.

Male.—Body 2.7 to 3 mm long, yellow in ground color. Thorax shiny, with four dark-brown vittæ on yellow scutum. Abdominal segments one to five yellow, each tergum with a dark, somewhat inverted, T-shaped band on caudal margin; other segments including hypopygium yellowish pale brown. Wings and hypopygium much as in *T. uraiensis* Tokunaga.

Head with frontal tubercles. Antennæ 14-segmented, with scapes dark brown; flagellum including plumose hairs brownish yellow; antennal ratio about 1.1. Thorax shiny; mesoscutum yellow, with median vittæ brown or dark brown, lateral vittæ black; scutellum yellow; postscutellum black; pleural sides brown; sternal side dark brown. Legs with coxæ brown; other segments yellowish white; foreleg ratio about 2.3; forelegs with short tarsal beards; pulvilli absent. Halteres pale brownish yellow. Wings as in *T. uraiensis*, macrotrichia only on distal areas of cells R_5 and M_2 , fMCu just beyond r-m. Hypopygium as in *T. uraiensis*, anal point with dotlike impression; dorsal appendages (Plate 4, fig. 83) setigerous, each with several long setæ on mesal margin; accessory lobe indistinct; ventroproximal appendages short, each with a tuft of simple setæ on apical end.

Female.—Body about 1.7 mm long, almost entirely pale brownish yellow. Scutum of mesothorax with brown or dark-brown vittæ. Abdomen almost entirely yellow, with trace of colored markings. Wings with thick macrotrichia, central area extensively bare.

Specimens.—Males and females; Taihoku, Formosa; August 12 to 18, and September 1, 1937.

Kieffer inadequately described and figured this species, representing the anal point of the male hypopygium as simple and

the dorsal appendages slender on the apical part and without setæ.

TANYTARSUS (TANYTARSUS) THERMÆ sp. nov.

This species is very abundant about hot springs (29° C. and pH 7) at Towada, Aomori-ken.

Male and female.—Body length about 2.2 to 2.6 mm. Ground color yellowish white; thorax with three brown vittæ. Male antennal ratio 0.85 to 0.95. Foreleg ratio 2.1 to 2.2.

Eyes bare, as widely separated on dorsal side as half of vertical length of eyes. Antennæ of male yellowish brown, with scapes pale reddish brown, 14-segmented; female antennæ 6-segmented. Thorax yellowish white; mesoscutum with three brown vittæ, median vitta subdivided by a median line of pale punctures, somewhat paler than lateral vittæ and rarely obscure; post-scutellum and sternal side brown; pleural side with two small brown clouds under base of wing; in female and sometimes in male colored markings of thorax yellowish pale brown. Legs without pulvilli and beards; tibial combs of posterior legs distinctly separated from one another, each with a spur. Wings closely as in *T. kyotoensis* Tokunaga but wing cells R_1 and R_3 narrower and vein R_{2+3} obliterated. Male hypopygium also closely allied to that of *T. kyotoensis*, with anal point slender, long, and simple; dorsal appendages (Plate 4, fig. 86) somewhat square, setigerous, without accessory lobe; ventroproximal appendages long, fully as long as ventral appendages, curved dorsad at tip, expanded into two flat lobes at end; styles elongated, narrowed on distal one-third. Female cercus somewhat rhombic.

Holotype.—Male; Tuta-onsen, Aomori-ken; October 14, 1935.

Allotopotype.—Female; October 14, 1935.

Paratypes.—Males and females; Tuta-onsen and Kuzu-onsen, Aomori-ken; October 14, 1935, and October 27, 1938.

This species is closely allied to *T. kyotoensis* Tokunaga. Another related species may be *T. tenellulus* Goetghebuer, which, however, is provided with a small accessory lobe of the dorsal appendage on the male hypopygium and with a foreleg ratio less than 2.

TANYTARSUS (CLADOTANYTARSUS) VAN-DER-WULPI Edwards.

Male.—Body about 2.5 mm long, almost entirely yellowish white. Thorax with three shiny, black vittæ on yellow scutum. Antennal ratio about 1. Foreleg ratio about 2.1. Wings with

macrotrichia only on distal tip of cell R_5 and closely along distal margin in cell M_2 .

Eyes bare, reniform. Antennæ 14-segmented, scapes black. Thorax with a dark pleural spot under base of wing; postscutellum and sternal side black; scutellum reddish brown. Legs without beards on forelegs; no pulvilli; tibial combs of posterior legs separated, each with a spur. Wings with veins hyaline; R_{2+3} ending at middle between tips of R_1 and R_{4+5} ; fMCu far beyond r-m; macrotrichia restricted only at extreme tip of wing; lobe of wing round. Hypopygium (Plate 4, fig. 85) with anal point small and many minute dots on basal excavated area; styles small, not distinctly narrowed apically; dorsal appendages swollen on basal half, with three or four setæ, accessory lobe longer than dorsal appendage, slender; ventral appendages short, stout, sparsely setigerous only on apical part; ventroproximal appendages short, each with a large tuft of flat and forked setæ.

Specimens.—Males; Toyohara, Sakhalin; August 31, 1938.

TANYTARSUS (MICROPSECTRA) PRÆCOX Meigen.

Male and female.—Body 4 to 4.3 mm long. Thorax brown in ground color; male with four subconfluent, dark-brown, scutal vittæ; female with four separated black vittæ. Male antennal ratio about 1. Foreleg ratio about 1.75.

Head brown, mouth parts pale brown; eyes bare, widely separated on dorsal side. Antennæ of male 14-segmented, with scapes dark brown, other parts pale brown. Maxillary palpus 5-segmented (2:3:11:11:22). Thoracic notum moderately shiny, scutum with two dark-brown median and two black lateral vittæ; humeral areas yellowish; pleural and sternal sides reddish brown; membranous areas yellow. Legs unicolored, brown or pale brown, without beards and pulvilli. Wings hairy all over surface; fMCu under r-m. Male hypopygium with anal point short; dorsal appendages broad, with several setæ on mesal side; accessory lobes very slender, small, not visible in dorsal aspect; ventroproximal appendages with spoon-shaped hairs on distal part.

Specimens.—Males and females; Mount Hiei, Kyoto, March 17, 1935.

In the Japanese specimens the ultimate segment of the male antenna is comparatively short, the antennal ratio being only 1, while in the European specimens the ultimate segment is longer, the antennal ratio being about 1.5.

TANYTARSUS (MICROPSECTRA) SUBVIRIDIS Goetghebuer.

Male.—Body about 3.8 mm long, yellow in ground color. Thorax with four yellowish pale-brown vittæ on scutum. Antennal ratio 1.1 to 1.2. Foreleg ratio about 1.73. Hypopygium closely resembling that in *T. præcox* Meigen.

Head yellow, without frontal tubercles; eyes bare, distance between eyes on dorsal side about half vertical length of eyes. Mouth parts yellow, with maxillary palpi 5-segmented (2:4:10:11:19). Antennæ pale brown, 14-segmented. Mesoscutal vittæ yellowish, separated; postscutellum and pleural and sternal sclerites yellowish pale brown; scutellum and pleural membranes yellowish white. Wings as in *T. præcox*. Halteres white. Legs pale brownish yellow, without beards and pulvilli; tibial combs of posterior legs large, confluent, without spurs; relative lengths of segments 75:52:90:46:36:27:13 in foreleg; 85:79:55:34:26:16:9 in hind leg. Abdomen white; posterior margins of anterior segments and entire tergal side of posterior segments pale brownish yellow.

Specimens.—Males; Kamikoti, Nagano-ken; July 19, 1932.

As described above, these Japanese specimens are all paler than the European specimens, in which the thorax and abdomen are green, with dark-brown markings instead of the yellowish markings of the Japanese specimens. This paler coloration of our specimens seems to represent a character of a local variety.

TANYTARSUS (MICROPSECTRA) SHINAENSIS sp. nov.

Male.—Body about 3.6 mm long, brown in ground color. Thorax shiny brown, with four subconfluent dark vittæ on scutum; scutellum brown. Antennal ratio about 0.81. Foreleg ratio about 1.63.

Head brown or reddish brown; eyes bare, strongly curved; distance between eyes greater than half of vertical lengths of eyes (8:13). Antennæ brown, with scapes dark brown; segmentation between ultimate two segments incomplete. Thorax with median vittæ reddish brown, lateral vittæ dark brown; scutellum and pleural sides brown; postscutellum and sternal side dark brown. Wings with macrotrichia thick; R_{2+3} obscure, ending before middle between tips of R_1 and R_{4+5} ; r-m long, about thrice length of basal section of R_{4+5} ; fMCu under r-m. Halteres white. Legs uniformly pale brown, pulvilli vestigial, empodium as long as claws; proportional lengths of segments 70:48:78:39:29:20:11 in foreleg; 84:75:50:31:24:16:10 in hind leg. Abdomen pale brown; hypopygium with anal point

small, excavated dorsally on basal part; dorsal appendages (Plate 4, fig. 84) subtriangular, broad and pubescent basally, beaklike and bare apically, without accessory lobes; ventral appendages straight, with curved bristles on distal two-thirds; ventroproximal appendages pubescent on stem, with spoon-shaped hairs on apical part; styles large, not distinctly narrowed apically.

Holotype.—Male; Kamikoti, Nagano-ken; July 19, 1932.

This species is somewhat allied to *T. monticola* Edwards in coloration, but in the allied species the antennal ratio is only 0.6, the leg ratio 1.5, and the hypopygium distinctly different from that of the present species, especially in the structure of the anal points and ventroproximal appendages.

ILLUSTRATIONS

PLATE 1

- FIG. 1. *Atrichopogon* (*Atrichopogon*) *minimus* Kieffer, female wing.
 2. *Atrichopogon* (*Atrichopogon*) *femoralis* sp. nov., female wing.
 3. *Atrichopogon* (*Atrichopogon*) *rostratus* Winnertz, female wing.
 4. *Atrichopogon* (*Atrichopogon*) *flavens* sp. nov., male wing.
 5. *Atrichopogon* (*Atrichopogon*) *marginipilus* sp. nov., male wing.
 6. *Atrichopogon* (*Kempia*) *longiserra* Kieffer, female wing.
 7. *Atrichopogon* (*Kempia*) *brunnipes* Meigen, female wing.
 8. *Atrichopogon* (*Kempia*) *maritimus* sp. nov., female wing.
 9. *Atrichopogon* (*Kempia*) *japonicus* sp. nov., female wing.
 10. *Atrichopogon* (*Kempia*) *pilosipennis* sp. nov., female wing.
 11. *Atrichopogon* (*Kempia*) *pilosipennis* sp. nov., male wing.
 12. *Ceratopogon* (*Trishelea*) *abdominalis* sp. nov., female wing.
 13. *Ceratopogon* (*Isohelea*) *albitarsis* sp. nov., female wing.
 14. *Ceratopogon* (*Isohelea*) *flaviventris* Kieffer, male wing.
 15. *Ceratopogon* (*Isohelea*) *minimus* Kieffer, female wing.
 16. *Ceratopogon* (*Isohelea*) *monticolus* sp. nov., male wing.

PLATE 2

- FIG. 17. *Ceratopogon* (*Isohelea*) *basiflagellatus* sp. nov., female wing.
 18. *Ceratopogon* (*Isohelea*) *basiflagellatus* sp. nov., male wing.
 19. *Alluaudomyia* *quinquepunctata* sp. nov., female wing.
 20. *Alluaudomyia* *undecimpunctata* sp. nov., male wing.
 21. *Alluaudomyia* *sagaensis* sp. nov., female wing.
 22. *Monohela* (*Monohela*) *tessellata* Zetterstedt, female wing.
 23. *Johannsenomyia* *shibuyai* sp. nov., male wing.
 24. *Pentaneura* *circumdata* sp. nov., female wing.
 25. *Pentaneura* *pleuralis* sp. nov., female wing.
 26. *Atrichopogon* (*Atrichopogon*) *rostratus* Winnertz, male, style.
 27. *Atrichopogon* (*Atrichopogon*) *parviforceps* sp. nov., male style.
 28. *Atrichopogon* (*Atrichopogon*) *flavens* sp. nov., male style.
 29. *Atrichopogon* (*Atrichopogon*) *femoralis* sp. nov., male style.
 30. *Atrichopogon* (*Kempia*) *spiniventris* sp. nov., female abdominal processes.
 31. *Atrichopogon* (*Kempia*) *pilosipennis* sp. nov., female abdominal processes.
 32. *Atrichopogon* (*Kempia*) *maritimus* sp. nov., female claw.
 33. *Atrichopogon* (*Kempia*) *pilosipennis* sp. nov., male style.
 34. *Atrichopogon* (*Kempia*) *maritimus* sp. nov., male style.
 35. *Stilobezzia* *albicornis* Kieffer, female distal two tarsal segments.
 36. *Atrichopogon* (*Kempia*) *spiniventris* sp. nov., male style.
 37. *Atrichopogon* (*Kempia*) *clavifuscus* sp. nov., male style.

- FIG. 38. *Atrichopogon* (*Kempia*) *yoshimurai* sp. nov., male style.
39. *Atrichopogon* (*Kempia*) *kagiensis* sp. nov., male style.
40. *Atrichopogon* (*Kempia*) *brunnipes* Meigen, male style.

PLATE 3

- FIG. 41. *Chironomus* (*Prochironomus*) *bifascipennis* sp. nov., female wing.
42. *Chironomus* (*Polypedilum*) *trimaculus* sp. nov., male wing.
43. *Johannsenomyia* *shibuyai* sp. nov., male hypopygium.
44. *Procladius* (*Procladius*) *karahutoensis* sp. nov., male style.
45. *Ceratopogon* (*Isohelea*) *falcifer* sp. nov., male style.
46. *Atrichopogon* (*Kempia*) *kyotoensis* sp. nov., male style.
47. *Ceratopogon* (*Isohelea*) *basiflagellatus* sp. nov., male style.
48. *Ceratopogon* (*Isohelea*) *monticolus* sp. nov., male maxillary palpus.
49. *Ceratopogon* (*Isohelea*) *minimus* Kieffer, male maxillary palpus.
50. *Ceratopogon* (*Isohelea*) *monticolus* sp. nov., male style.
51. *Atrichopogon* (*Kempia*) *akizukii* sp. nov., male style.
52. *Pentaneura* *pleuralis* sp. nov., male style.
53. *Cricotopus* *tremulus* Linnæus, male style and mesal lobe of coxite.
54. *Cricotopus* *bituberculatus* sp. nov., male style and mesal lobe of coxite.
55. *Cricotopus* *nitens* (Kieffer), male style and mesal lobe of coxite.
56. *Cricotopus* *trifascia* Edwards, male style.
57. *Spaniotoma* (*Orthocladius*) *multiannulata* sp. nov., male style.
58. *Spaniotoma* (*Smittia*) *tipuliformis* sp. nov., male coxite and style.
59. *Spaniotoma* (*Limnophyes*) *fuscipygma* sp. nov., male style and mesal lobe of coxite.
60. *Spaniotoma* (*Smittia*) *vesparum* Goetghebuer, male style and mesal lobe of coxite.
61. *Spaniotoma* (*Smittia*) *vesparum* Goetghebuer, female third antennal segment.
62. *Spaniotoma* (*Smittia*) *aterrima* Meigen, male style and mesal lobe of coxite.
63. *Spaniotoma* (*Orthocladius*) *multiannulata* sp. nov., female cercus.
64. *Pentapedilum* (*Pentapedilum*) *tuberculatus* sp. nov., male ventral appendage of hypopygium.
65. *Chironomus* (*Microtendipes*) *fuscipennis* Meigen, male dorsal appendage of hypopygium.
66. *Chironomus* (*Microtendipes*) *karafutonis* sp. nov., male dorsal appendage of hypopygium.
67. *Chironomus* (*Prochironomus*) *bifascipennis* sp. nov., male appendages of hypopygium.
68. *Chironomus* (*Limnochironomus*) *lobiger* Kieffer, male dorsal and ventral appendages of hypopygium.
69. *Chironomus* (*Microtendipes*) *yamasinensis* sp. nov., male ventral appendage of hypopygium.
70. *Pentapedilum* (*Pentapedilum*) *tuberculatus* sp. nov., male dorsal appendage of hypopygium.
71. *Chironomus* (*Stictochironomus*) *akizukii* sp. nov., male dorsal appendage of hypopygium.

- FIG. 72. *Chironomus* (*Microtendipes*) *yamasinensis* sp. nov., male dorsal appendage of hypopygium.
 73. *Chironomus* (*Polypedilum*) *nubeculosus* Meigen, male dorsal appendage of hypopygium.
 74. *Pentapedilum* (*Phænopsectra*) *kizakiensis* sp. nov., male dorsal appendage of hypopygium.
 75. *Chironomus* (*Cryptochironomus*) *viridulus* Fabricius, male anal point of hypopygium.

PLATE 4

- FIG. 76. *Chironomus* (*Glyptotendipes*) *gripekoveni* Kieffer, male dorsal appendage of hypopygium.
 77. *Chironomus* (*Glyptotendipes*) *paripes* Edwards, male dorsal appendage of hypopygium.
 78. *Chironomus* (*Chironomus*) *trinigrivittatus* sp. nov., male dorsal appendage of hypopygium.
 79. *Chironomus* (*Chironomus*) *dystenus* Kieffer, male dorsal appendage of hypopygium.
 80. *Chironomus* (*Chironomus*) *circumdatus* Kieffer, male dorsal appendage of hypopygium.
 81. *Chironomus* (*Chironomus*) *nipponensis* sp. nov., male dorsal appendage of hypopygium.
 82. *Chironomus* (*Cryptochironomus*) *sauteri* Kieffer, male dorsal appendage of hypopygium.
 83. *Tanytarsus* (*Tanytarsus*) *formosanus* Kieffer, male dorsal appendage of hypopygium.
 84. *Tanytarsus* (*Microsectra*) *shinanoensis* sp. nov., male dorsal appendage of hypopygium.
 85. *Tanytarsus* (*Cladotanytarsus*) *van-der-wulpi* Edwards, male anal point and dorsal appendage of hypopygium.
 86. *Tanytarsus* (*Tanytarsus*) *thermæ* sp. nov., male dorsal appendage of hypopygium.
 87. *Culicoides unguis* sp. nov., female wing.
 88. *Dicrobezzia sugiyamai* sp. nov., female wing.
 89. *Stilobezzia albicornis* Kieffer, female wing.
 90. *Stilobezzia notata* de Meijere, female wing.
 91. *Stilobezzia monticola* sp. nov., female wing.
 92. *Stilobezzia notata* de Meijere, male hypopygium.
 93. *Stilobezzia monticola* sp. nov., male hypopygium.
 94. *Ceratopogon* (*Trishelea*) *incompleta* Kieffer, male style.
 95. *Atrichopogon* (*Atrichopogon*) *ezoensis* sp. nov., male style.

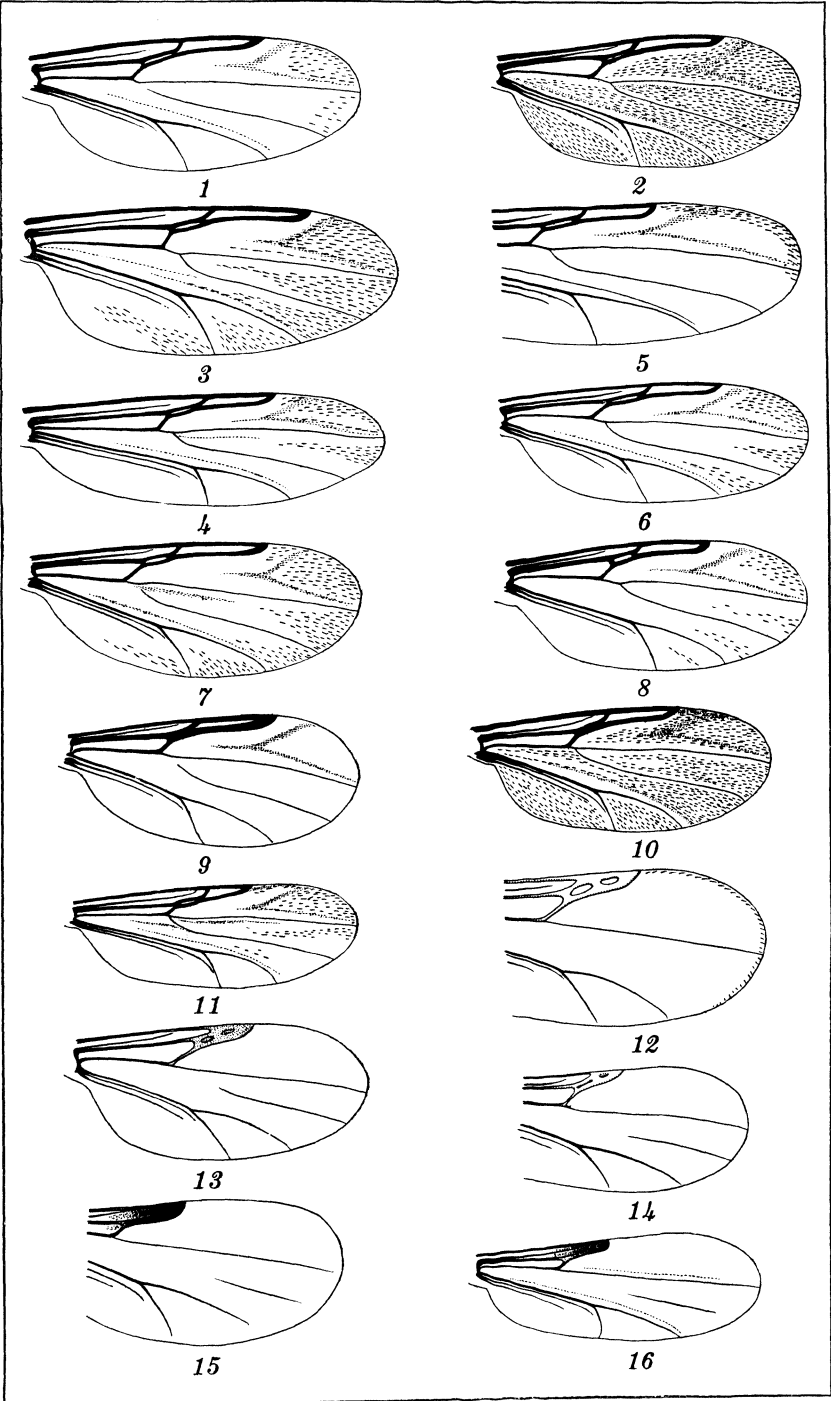


PLATE 1.

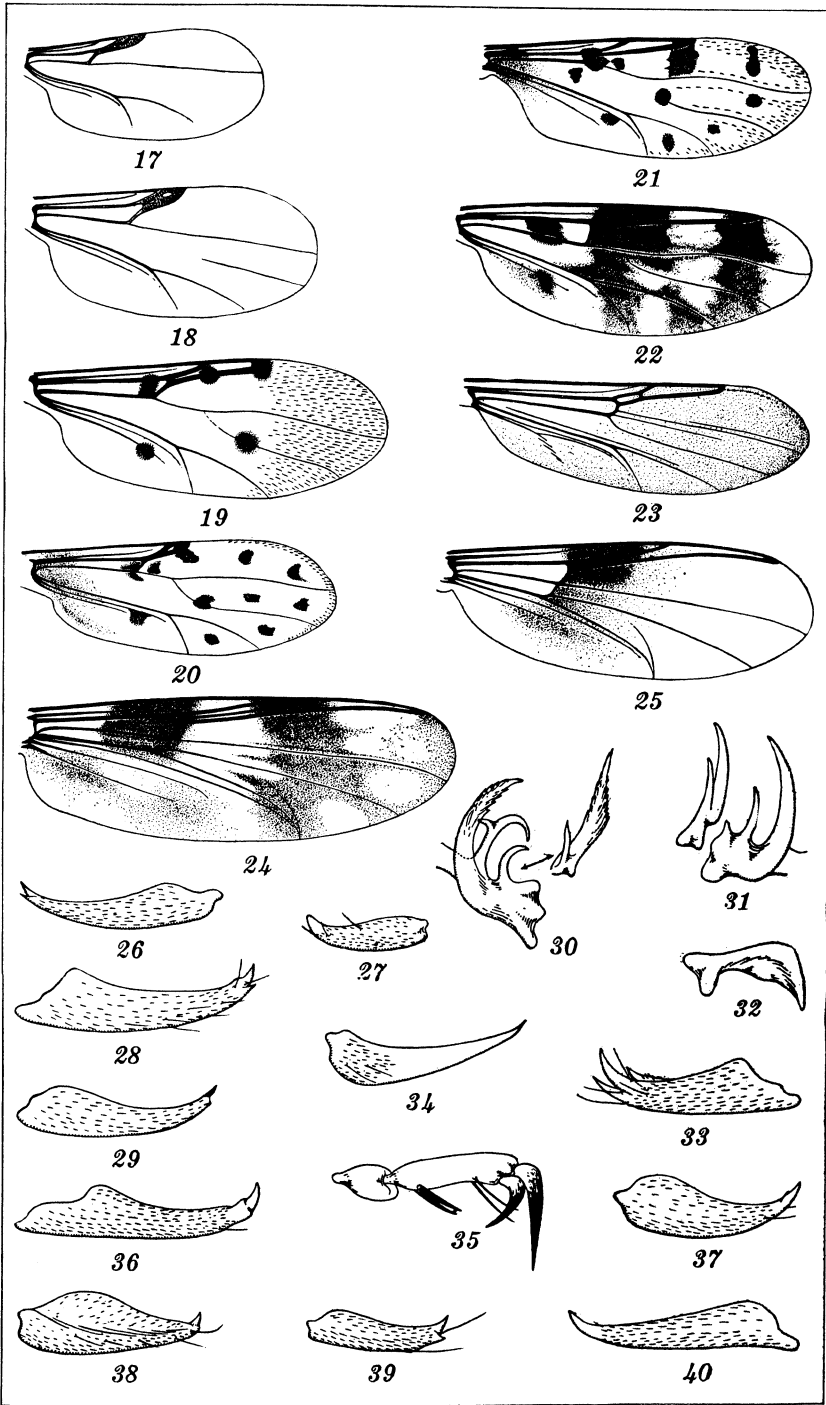


PLATE 2.

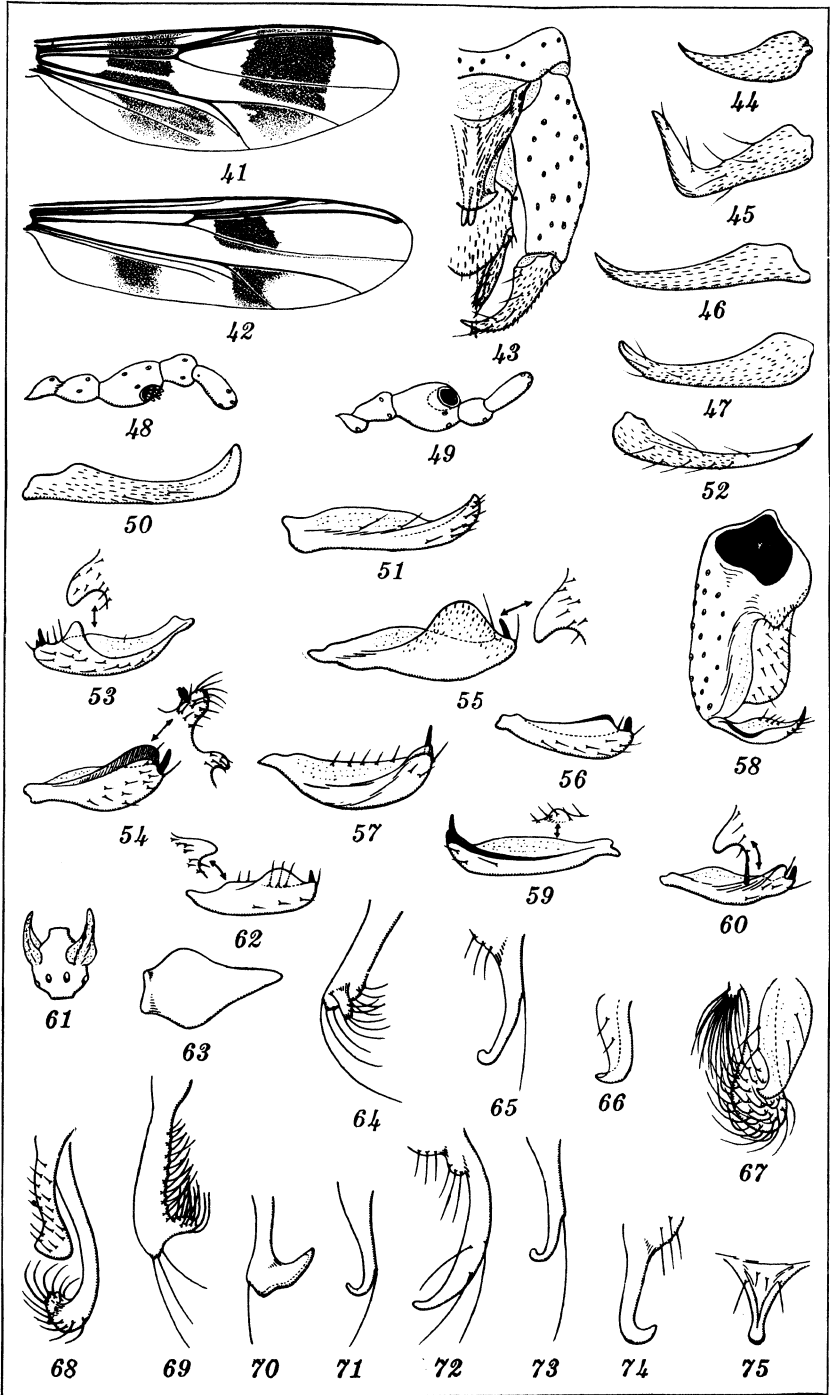


PLATE 3.

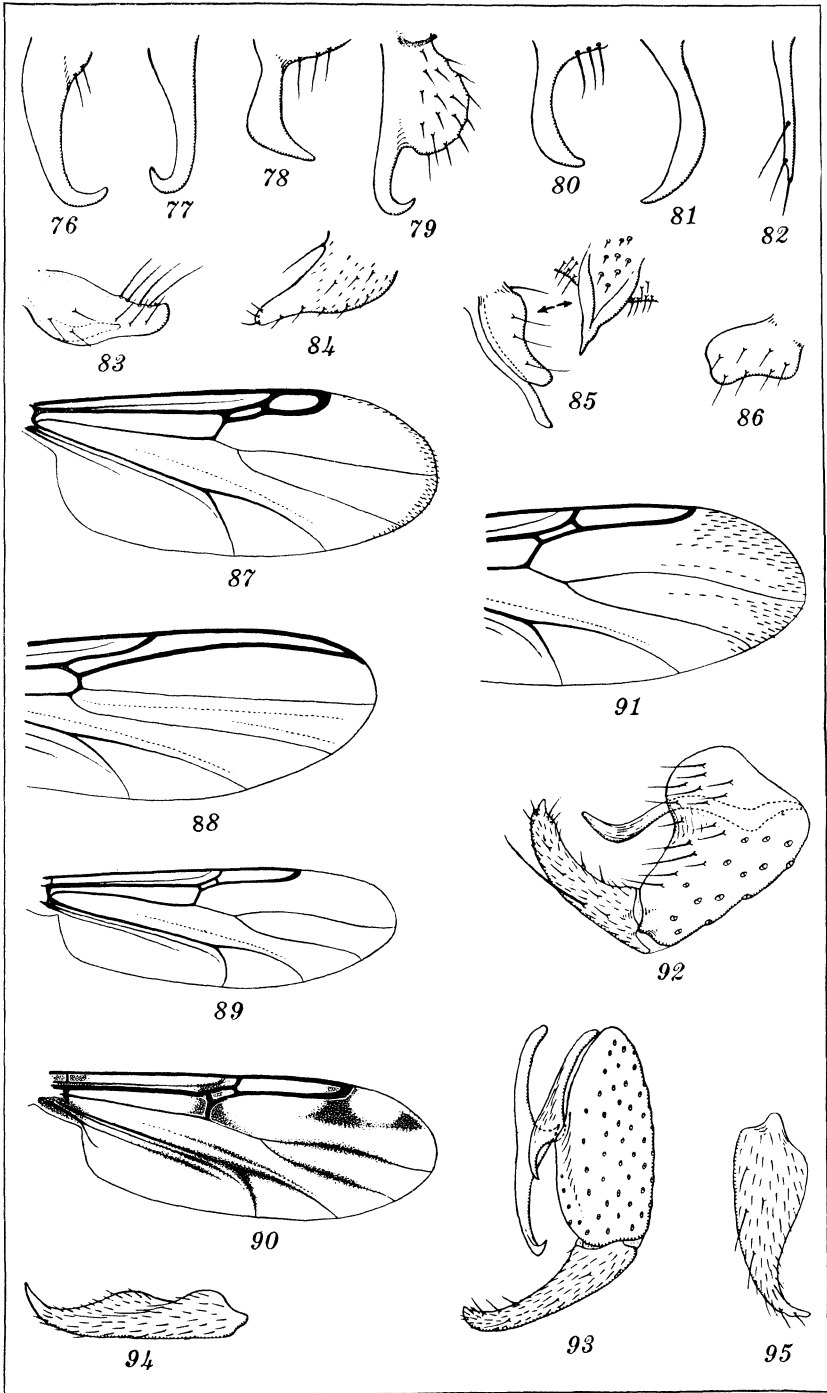


PLATE 4.

PHILIPPINE CORYPHÆNIDÆ

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ONE PLATE

This paper deals with the systematic description of *Coryphæna hippurus* Linnæus, of the family Coryphænidæ, not previously reported from the Philippines. The description is based on a single specimen collected by the writer from Naujan, Mindoro, May 19, 1939, and at present kept in the ichthyological collection, Division of Fisheries, Department of Agriculture and Commerce, Manila.

The family includes the "dolphins," or "dorados," fast-swimming pelagic fishes abounding in the open sea, and considered excellent food fishes, usually caught by trolling.

CORYPHÆNIDÆ

Body oblong or elevated, compressed, with small, firm, cycloid scales. Lateral line irregularly curved above pectoral, becoming straight behind it up to caudal. Mouth wide. Opercular apparatus entire. Branchiostegals five to seven. Gill membranes free from isthmus. Pseudobranchiæ and air bladder absent. Dorsal single, without distinct spinous portion. Anal similar to dorsal but very much shorter. Dorsal and anal without true spines. Pectorals falcate, short. Ventrals thoracic. Caudal deeply forked.

Large pelagic fishes living on the high seas of all temperate and tropical regions.

Genus CORYPHÆNA Linnæus

Coryphæna LINNÆUS, Syst. Nat. ed. 10 (1758) 261; CUVIER and VALENCIENNES, Hist. Nat. Poiss. 9 (1833) 203.

Lampugus CUVIER and VALENCIENNES, tom. cit. 235.

Body compressed, rather elongate; adult specimens with an elevated crest on skull; cleft of mouth oblique, chin slightly prominent. Dorsal single, extending from occiput nearly to caudal, which is deeply forked; no distinct dorsal and anal

spines; ventrals well developed, retractable partly into a groove on abdomen. Bands of recurved teeth in jaws, vomer, and palatines. Two patches of villiform teeth on tongue. Pyloric appendages exceedingly numerous.

CORYPHÆNA HIPPURUS Linnæus. Plate 1.

Coryphæna hippurus LINNÆUS, Syst. Nat. 10 (1758) 261; CUVIER and VALENCIENNES, Hist. Nat. Poiss. Paris 9 (1833) 206; GÜNTHER, Catalogue of Fishes in the British Museum 2 (1860) 405; FISCHE der Südsee II (1876) Journ. des Mus. Godeffroy 4 (1876-1881) 146; KLUNZINGER, Synopsis der Fische des Rothen Meeres. pt. 1 Percoiden—Mugiloiden. Verh. Zool. Bot. Ges. Wien 20 (1870) 446; LÜTKEN, Spolia Atlantica: contributions to the knowledge of the changes in forms in fishes, during their growth and development especially in the pelagic fishes of the Atlantic. Ann. & Mag. Nat. Hist. 7 (1881) 12; STEINDACHNER and DÖDERLEIN, Beiträge zur Kenntniss der Fische Japans. Denkschr. Akad. Wien 49 (1885) 171; DAY, Fishes of India 4° (1878-1888) 248; JENKINS, Report on the collection of fishes in the Hawaiian Islands, with description of new species. Bull. U. S. Fish Commission 22 [1902 (1904)] 447; JORDAN and EVERMANN, The aquatic resources of the Hawaiian Islands. Bull. U. S. Fish Commission 23 [1903 (1905)], 204; WEBER, Die Fische der Siboga Expeditie (1913) 409; McCULLOCH, Check-list of the fish and fish-like animals of New South Wales. Aust. Zool. 1 (1919) 54; BARNARD, A monograph of the marine fishes of South Africa. II. Ann. South African Mus. 21 (1925-1927) 566; Fowler, Fishes of Oceania. Mem. B. P. Bishop Mus. 10 (1928) 137; WEBER and DE BEAUFORT, The Fishes of the Indo-Australian Archipelago 6 (1931) 185.

Coryphæna margravii CUVIER and VALENCIENNES, Histoire Naturelle des Poissons. Paris 9 (1833) 223.

Lampugus fasciolatus CUVIER and VALENCIENNES, Histoire Naturelle des Poissons. Paris 9 (1833) 243; BLEEKER, Ouer eenige Vischsoorten van den Kaap de Goode Hopp. Nat. Tijdschr. Ned. Ind. 21 (1860) 66.

Coryphæna japonica TEMMINCK and SCHLEGEL, Fauna Japonica. Poiss. (1842) 120.

Head 4; depth 4.4; dorsal 56; anal 24; pectoral 20, ventral 5.

Body elongate, compressed, tapering posteriorly. Head blunt, slightly convex. Mouth large, cleft oblique. Maxillary terminating below anterior margin of pupil. Jaws, palatines, and vomer with bands of recurved teeth; outer series on jaws larger, directed inward, set wide apart. Snout convex, about 3 in head. Eye 4.5 in head length. Interorbital greater than eye, with a slight rostronuchal crest. Opercular opening wide. Gill rakers 8, short and blunt. Dorsal originating above posterior border of eye, twelfth to sixteenth rays highest, gradually decreasing posteriorly. Anal of similar structure, but lower.

Pectorals falciform, short, 7 in standard body length. Ventrals inserted below anterior third of pectoral base, 1.4 in head. Caudal deeply forked.

Alcoholic specimen purplish black above, whitish below, with small black spots on sides, above and below lateral line.

The above description is based on a single specimen, No. 31954, 420 mm, collected from Naujan, Mindoro, May 19, 1939.

In the Philippines this species is quite rare and seldom, if at all, encountered in fish markets. It is known to inhabit the tropical and temperate seas of the Mediterranean, Atlantic, and Indo-Pacific.

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ILLUSTRATION

PLATE 1. *Coryphæna hippurus* Linnæus.

[The graphic scale represents 1 cm.]

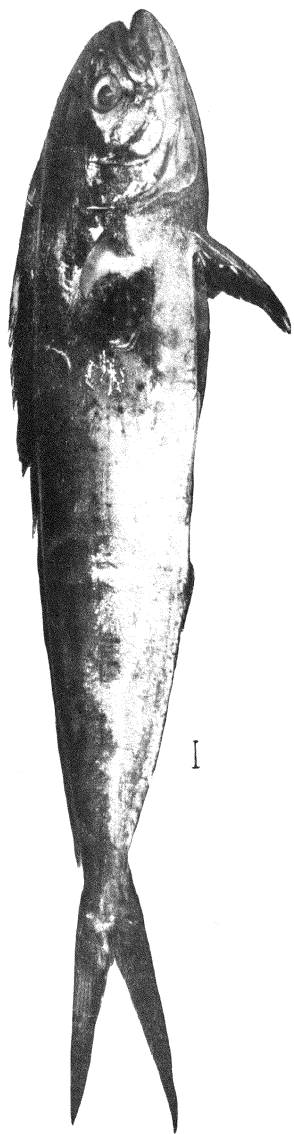


PLATE 1. CORYPHÆNA HIPPURUS LINNÆUS.

THE SALT-MAKING INDUSTRY OF NORTHWESTERN LUZON

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THREE PLATES AND TWO TEXT FIGURES

This report presents the results of field studies made on the salt industries of Ilocos Norte, Ilocos Sur, La Union, and Pangasinan Provinces.

In Ilocos Norte Province the salt beds are located in Davila, Dilavo, and Santo Tomas of Pasuquin Municipality; in La Paz and Gabu of Laoag Municipality; in Masinloc, Callaguip, and Salindag of Paoay Municipality; in Gaang of Currimaog Municipality; and in Soucud and Pagsanaan of Badoc Municipality. In Ilocos Sur Province salt beds are situated in Dalaguitan, Bantay, Cabangtalan, and Paratong of Sinit Municipality; in Bongro, Daklapan, Dardarat, and Solotsolot of Cabugao Municipality; in Pagsanaan and Miramar of Magsingal Municipality; in Pudoc of San Vicente Municipality; in Mindoro and San Pedro of Vigan Municipality; in Pasungol and Rancho of Santa Maria Municipality; in Paratong and San Pedro of Narvacan Municipality; in Nalvo and Lingsat of San Esteban Municipality; in Apatot, Ambucan, and Sabañgan of Santiago Municipality; in Nagalisan and Baling of Santa Lucia Municipality; and in Bay and Baygao of Santa Cruz Municipality. In La Union Province salt beds are present in Mindoro, Alzate, and Busilac of Bangar Municipality; in Nalvo, Paraoir, and Darigayos of Luna Municipality; in Madayegdeg, Pagdar-aogan, and Pagdalagan of San Fernando Municipality; in Baybay, Rawis, and Namonitan of Santo Tomas Municipality; in Payocpuc Norte, Payocpuc Sur, and Parian of Bauang Municipality; in Arinog Point of Arinog Municipality; and in Baroro of San Juan Municipality. In Pangasinan Province salt beds are located in Tambobong, Amalbalan, Malacapas, Uli Egui, Hermosa, and Macaleng of Dasol Municipality; in Carot, Tondol, Sabling, Macalieng, Dalaoan, Cabungan, Awili, Nara, Siapar, Toritori, and Maluog of Anda

Municipality; in Bateng, Bantayan, Talogtog, Maasin, and Anulid of Mangaldan Municipality; in Tambac, Bonuan, Salapiñgao, Carael, and Sabañgan of Dagupan Municipality; in Baybay, Baquioen, Salumagui, and Aroro of Sual Municipality; in Telbang, Lucap, and Hundred Islands of Alaminos Municipality; in Na-

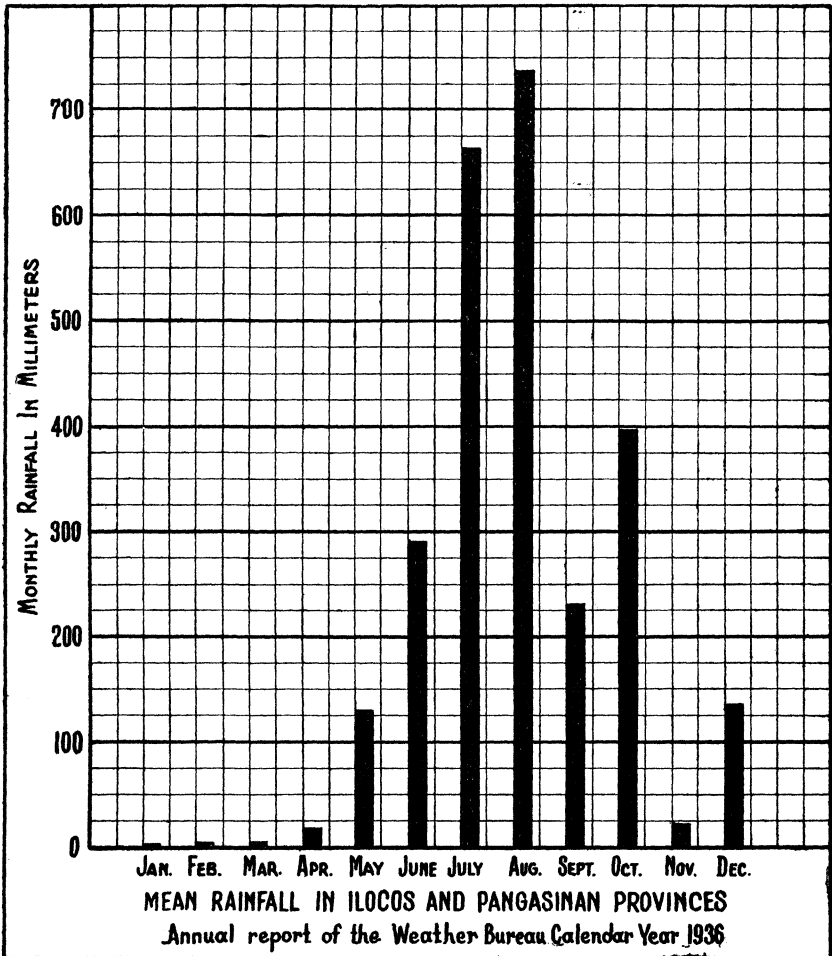


Fig. 1. Mean rainfall in Ilocos and Pangasinan Provinces.

yon, Cato, Bayambang, and Banog of Infanta Municipality; in Binabalian, Pilar, Dewey, and Zaragosa of Bolinao Municipality; in Loñgos, Cayaña, and Mabilao of San Fabian Municipality; and in Libsong Maniboc of Lingayen Municipality.

Due to its topography and climatic conditions, this region has two distinct seasons, wet and dry. The Cordillera Mountains run from North to South and are traversed by the Caraballo Mountains. The wet season occurs during the typhoon season, May to October. Text figs. 1 and 2 are charts of the monthly rainfall in Laoag, Ilocos Norte Province; Vigan, Ilocos Sur Province; San Fernando, La Union Province; and Dagupan, Pangasinan Province. During the typhoon season these mountain ranges cause the winds from China Sea to deposit their mois-

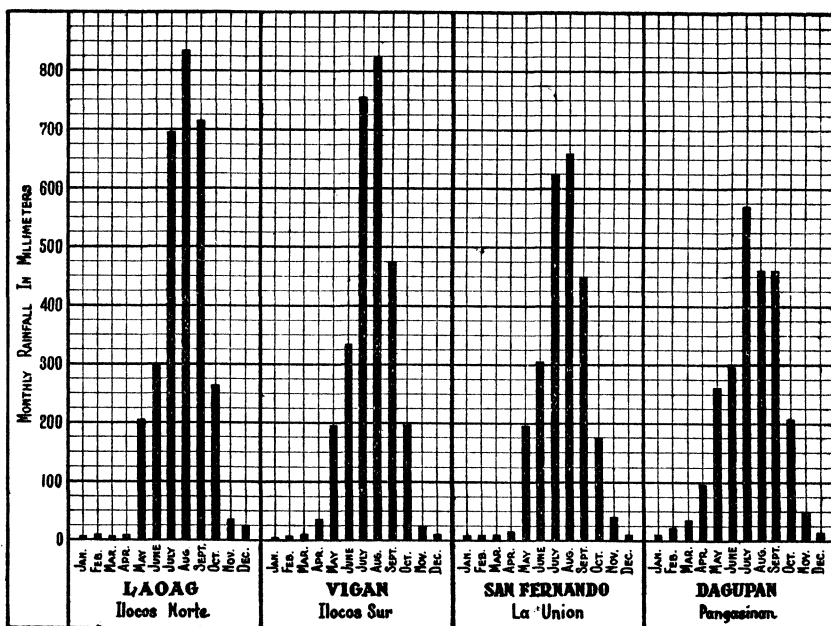


Fig. 2. Types of monthly rainfall in Laoag, Ilocos Norte; Vigan, Ilocos Sur; San Fernando, La Union; and Dagupan, Pangasinan.

ture in large quantities on the plain; but they protect the plains completely from the northeast monsoons, which therefore bring no rain to this region. Moreover, in this region precipitation from the thunderstorms of March and April is deposited in the mountains and not on the plains. The six months after the wet season constitute the dry season, during which wet farming is not profitable, and the people take up other occupations such as salt making and dry farming. The season of salt making lasts from January to June.

The annual consumption of salt in the Philippines is 67,000,000 kilograms, valued at about 1,049,000 pesos.¹ The principal salt consumers are the manufacturers of bagoong,² local fish driers and salters, and laundry-soap makers. The demand for salt will undoubtedly increase as the Philippines ventures farther into industrial development, especially in the fishing industries.

In addition, salt is used for (a) food, (b) toyo making (soy-bean sauce), (c) fertilizers, (d) curing of hides and skins, (e) as a source of brine in making ice cream, in refrigeration, and in ice factories.

MATERIALS FOR SALT MAKING

Tables 1 and 2 are itemized lists of the equipment and capital needed for salt manufacture by the local method:

TABLE 1.—*Equipment used in salt making by the local method and cost.*

Local name.	English term.	Cost. Pesos.
Alolong or calapao	Shed	5.00
Babaco or laga	Bamboo basket	.60
Barilis	Wooden keg	.60
Bocsot or laga	Bamboo basket	2.00
Cajon	Wooden box	.50
Dakoan	Leaching vat	4.00
Goyuran	Yoke and rope	.60
Isec (calaticat)	Bamboo reinforcement	.30
Ragadi	Saw	1.00
Nipa tapi	Apron of vat	.80
Pasig or malabi	Earthenware	4.50
Pilon	Earthen jars	.70
Sagar	Harrow	.70
Siliasi	Kettle	6.50
Sursur	Iron lath	.10
Timba	Pail	.20
Tongtong or caraan	Furnace or oven	1.00
Oasay	Axe	1.50
Upa ti daga	Land rental	6.50
Total		37.10

¹ Notes on Salt Manufacture. Agricultural and Industrial Monthly (October, 1937). One peso equals 50 cents United States currency.

² Fermented fish product.

TABLE 2.—Daily operating expenses in salt making.

Item.	Pesos.
Fuel	.60
Kerosene	.10
Labor	2.40
Depreciation	.20

A shed, *alolong* (Pang.), Plate 3, fig. 1, serves as temporary shelter for salt makers and at the same time as a storehouse to accommodate the necessary materials. It is made of local light materials, such as nipa or cogon grass, for roofing and walling, and of bamboo posts.

There are three types of leaching vats commonly used in the preparation of the brine. One of these, the *colongcong* (Ilk.), made of wood, resembles a banca in shape. It is 10 feet long, 2 feet deep, and 2 feet wide. (Plate 3, fig. 2.) The *dakoan* (Pang.) is a trapezoidal receptacle, more than 2 meters long, more than 1 meter deep, and 1 meter wide (Plate 3, fig. 3). The other type is a large bamboo basket, *bakar* (Ilk.), with a diameter of 3.5 feet and up to 2 feet high (Plate 2, figs. 1 and 2).

The *tongtong*, Plate 2, fig. 3, or earthen oven, *pugon* (Pang.), is fashioned of pounded soil, reinforced with woven bamboo to strengthen the foundation and to make the oven more substantial. On the oven are two openings, one on top into which the kettle is fitted and the other in front through which fuel is inserted. Construction generally requires about two days, and hardening takes about two days more. It is the general contention among the local salt makers that a faultily constructed oven consumes much fuel.

The *siliasi* is either a kettle in the shape of a deep-bellied circular bowl or a rectangular container, with an average capacity of 3 to 5-gallon cans of brine. The number of boilings made in a day depends on the type of kettle and on the efficiency of the oven.

The containers to accommodate the brine leached from the soil are kegs; such as *pilon*, a wide-mouthed earthen jar; *pasig*, a narrow-necked earthen vessel; *timba*, a locally-made pail; and *barilis*, a deep wooden keg.

The tools used for the preparation of the fuel are the *ragadi* (saw) and the *oasay* (axe) with which fuel is split for the oven.

The tools, Plate 1, fig. 1, used for loosening earth are the *sagar*, a wooden, harrow-shaped implement equipped with a series of nails; a *goyuran* unit, a set of ropes and yokes with

which the sagar is pulled by a work animal, usually a carabao; bamboo rigs, like bamboo pushers; and empty coconut shells to scrape up the surface soil.

The implements required in evaporating the brine are the *gumba*, of circularly woven bamboo *sawali*, furnished with a handle to counteract overflow; *caus ti luag*, a foam scraper to remove impurities; *sursur*, an iron lathe for turning over crystallizing salt to prevent overcooking; and a coconut-shell laddle with which the salt is dipped out from the kettle into a home-made basket for draining the salt off the "bittern."

METHOD

The manufacture of table salt commonly consists in the evaporation of brine solution over artificial heat. The process is always the same with only slight variation in the choice and use of implements. In Batangas, Bulacan, Cavite, and Rizal Provinces the brine is evaporated by solar heat.

Fishponds and other coastal areas influenced by tidal water and in a dry state are usually utilized. Most of the beds have clay soil, and only a few have fine sandy loam. The clay soil is loosened with the sagar and goyuran units often pulled by an animal, and the loosened earth is raked by a bamboo pusher to form a series of mounts. These mounts are carried either in bull carts or in baskets and piled near the leaching vat. With sandy loam coconut shells or split bamboos are used to scrape up the surface soil.

The filtering vat filled with salt-encrusted soil from the pile is leached with brackish water from a nearby well. The leaching is discontinued when all the salt is extracted; otherwise the filtered brine is not concentrated enough for evaporation.

The specific gravity or salinity of the brine is determined in four ways. One way is to throw into the brine *arinaya* (Ilk.), small branches of shrubs usually found growing along the shores. If the *arinaya* floats, the brine is considered concentrated enough for evaporation. If it sinks leaching is continued. Another way is to float *tongaltao* (Ilk.), a native resin prepared in small pebblelike particles. If this pebblelike resin floats, the solution is ready for evaporation, otherwise the brine is further concentrated through leaching. Another method to ascertain the concentration of the brine solution is the least accurate of all the native methods used. The fingers are inserted through the leached mud from the fish pond. Leaching is continued until the fingers can no longer feel the

roughness which is characteristic of salt particles. Still another method is the use of a small bottle containing a few stone weights. This bottle is tightly corked and is tied to a string by which it is held during the test.

The concentration may also be ascertained by a gravity spindle or salometer, a hydrometer which is specially graduated for salt solutions. A vat with a capacity of approximately 57 5-gallon cans of earth leached with 34 5-gallon cans of brackish water gives a brine content of 16 5-gallon cans for cooking. The preparation of the brine takes approximately 8 hours. In this leaching operation there is great variation of salometric readings for every filling of a pilon containing 4.33 5-gallon cans. Table 3 shows the variation.

TABLE 3.—*Variation of the concentration of brine.*

Sample.		Number of 5-gallon cans of brine.	Salinity reading.
1	-----	4.33	95
2	-----	4.33	92
3	-----	4.33	83
4	-----	3.00	64
Total..... 16		Average.....	83.5

March 9, 1938, the brine ready for boiling in barrio Tambac, Dagupan, Pangasinan Province, was measured by a salinometer, and gave the following concentrations:

Sample.	Concentration.
1	100.0
2	97.0
3	98.0
4	96.0
5	89.5
6	99.0

The peak of salt making in this part of Luzon is March, when concentration readings are high. Approximately 8 hours of boiling or evaporation are needed to crystallize the salt from the brine. During this process a gradual generation of heat is necessary, with constant turning over of the salt in order to prevent it from burning and overcooking. The impurities which show on the surface as foam during boiling are scooped off. When the pickle diminishes in volume by more than 5 gallons, the general practice of some salt producers is to replace the same

volume by adding fresh brine with the sole purpose of getting more salt. In other localities no replacement of what is evaporated is made and the brine is simply boiled until the salt crystallizes out. When boiling has reached a point when all salt has settled, the salt is placed into a bamboo basket to dry over night before it is stored in wooden boxes. For the next cooking the kettle is refilled and the same process is repeated. Generally a well-constructed oven has an output of $1\frac{1}{2}$ cavans of salt in 24 hours.

CHEMICAL ANALYSIS

Table 4 shows the result of chemical analysis of four samples of salt submitted by the Fish and Game Administration³ to the Tests and Standards Division, Bureau of Science.

TABLE 4.—*Chemical analyses of four samples of salt from the four localities studied.*

Chemical compound.	Ilocos Norte.	La Union.	Ilocos Sur.	Pangasinan.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
CaSO ₄	0.880	0.310	0.820	1.16
MgSO ₄	1.070	1.500	1.010	1.64
MgCl ₂	0.360	0.620	1.350	0.43
Kcl.....	11.390	9.950	9.740	8.40
NaCl.....	85.840	80.590	76.720	85.00
SiO ₂	0.040	0.130	0.100	0.34
Fe ₂ O ₃	0.004	0.006	0.008	0.02
Al ₂ O ₃	0.036	0.274	0.492	0.46
Moisture at 105°C.....	0.830	6.830	9.770	7.38

Table 4 shows that considerable moisture is present in the salt samples from La Union, Ilocos Sur, and Pangasinan Provinces, due to the presence of impurities, like magnesium and calcium salts, which have a great affinity for moisture. Magnesium also imparts a markedly bitter taste to the salt (Tressler 1923).

THE SALT TRADE OF PANGASINAN AND THE ILOCOS PROVINCES

The salt produced in the coastal regions of Pangasinan, La Union, Ilocos Sur, and Ilocos Norte Provinces is an article of local trade. A small amount is bartered for fuel, rice, root crops, and other products, but the bulk of the salt produced in

³ Now the Division of Fisheries, Department of Agriculture and Commerce.

Pangasinan and Ilocos Sur Provinces is sold for cash to fish-preservation plants. The salt trade is active during the peak of the season, when the price of salt is rather low. People with ready cash buy salt at low prices and store it until the rainy season when the price goes up. Owners of some bagoong plants usually send out an agent to buy salt at a low price. In Pangasinan Province the municipalities of Anda, Dasol, and Infanta, produce salt in excess of the local demand. The salt is shipped in sail boats, which make regular calls during the season at these points, to the bagoong plants in San Fabian, Damortis, Aparri, and Cagayan. The cost of transporting a cavan of salt from any of the above salt beds to these points is 20 centavos, more or less, depending upon the distance.

Estimated annual production of salt.

Province.	Cavans.	Value. Pesos.
Ilocos Norte	15,000	12,528
Ilocos Sur	39,000	31,731
La Union	8,911	7,128
Pangasinan	135,000	108,000
Total		158,387

The salt industry of these provinces is estimated to have an annual output valued at around 158,387 pesos.

SUMMARY AND RECOMMENDATIONS

The estimated cost of production of a cavan of salt by cooking is approximately 3 pesos. Its sale value at the local plants (during the peak of production, March and April) is only about 80 centavos. Thus, the local producers are getting only about 35 per cent of the cost of production. On the other hand, the middlemen who buy the salt at 80 centavos are able to sell at the rate of 1.80 pesos to 2.50 pesos per cavan, making a gross profit from 110 to 210 per cent. On this basis, even if the local producers wait for the highest price to sell their salt, the price is still below the production cost, and the production of salt locally with the use of artificial heat is an unprofitable venture. The salt produced is of fine grain and has a sodium chloride content of 85 per cent. The output per oven is 1½ cavans in 24 hours.

In the production of salt by the solar method, locally introduced as the "Cavite process", where sun energy is employed, fishponds, lower areas, or tidal lands along the coast line are prepared for salt making. Fuel cost is totally eliminated. The

expense involved in the construction of the plant, however, should not be overlooked.

Cox and Dar Juan (1915) estimate that the production per laborer by the solar method is about 200 kilograms or 4 cavans of salt per day, salable at 50 centavos a cavan. The deduction of 1.20 pesos for labor and equipment leaves a gross income of 80 centavos per day. It is seen that the gross margin of profit by the solar method is a little more than the expense for fuel in 24 hours by the boiling method.

Herre and Mendoza estimate that solar salt that may be produced from more than one half hectare of land is 600 to 800 *ticlis* or cavans, with a value of from 300 to 400 pesos.

The manufacture of salt by the solar method carries, therefore, several advantages over that by the boiling method. In view of these advantages it may be worthwhile to introduce in northern Luzon the manufacture of salt by the solar method.

Local producers employing the cooking method, upon realizing the advantage of the new method, may abandon the old and unprofitable one. There are several localities, mostly in Pangasinan Province, where salt beds may be advantageously constructed; for example, in Anda, Dasol, and Infanta. These are at present producing large quantities of salt by the boiling method. They are accessible by sailboat, which is a good means of shipping the product to the markets.

The present product is below the standard of purity in comparison with foreign salt; naturally, the product for the preservation of which it is employed is of inferior quality.

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ILLUSTRATIONS

PLATE 1

- FIG. 1. Loosening surface soil by means of the *sagar*.
2. Mounts of surface soil.
3. Conveying brine into the cooking shed.

PLATE 2

- FIG. 1. Type of leaching vat made of baskets.
2. Another type of leaching vat used in making salt.
3. Earthen oven (*pugon*).

PLATE 3

- FIG. 1. Temporary shed (*alolong*, Pang.).
2. Leaching vat (*colongcong*, Ilk.).
3. A typical leaching vat (*dakoan*, Pang.).

TEXT FIGURES

- FIG. 1. Mean rainfall in the Ilocos and Pangasinan Provinces.
2. Types of monthly rainfall of Laoag, Ilocos Norte; Vigan, Ilocos Sur; San Fernando, La Union; and Dagupan, Pangasinan.

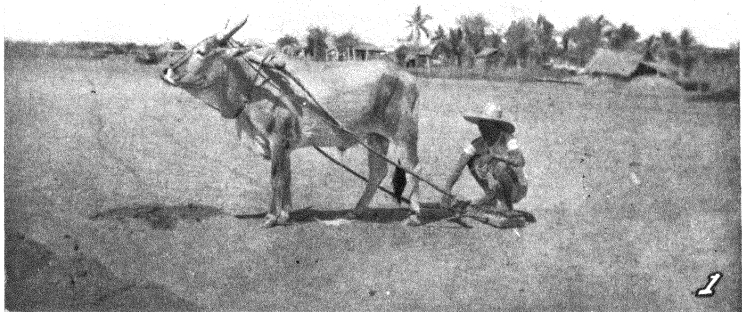


PLATE 1.

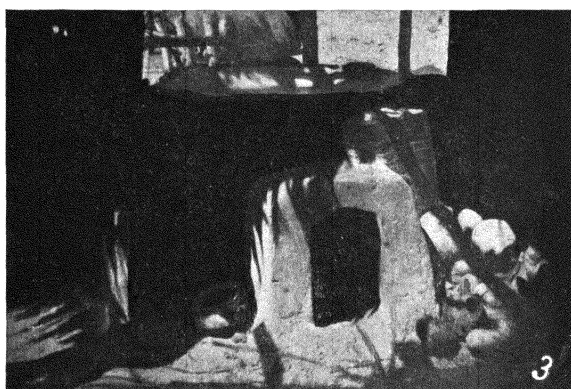


PLATE 2.

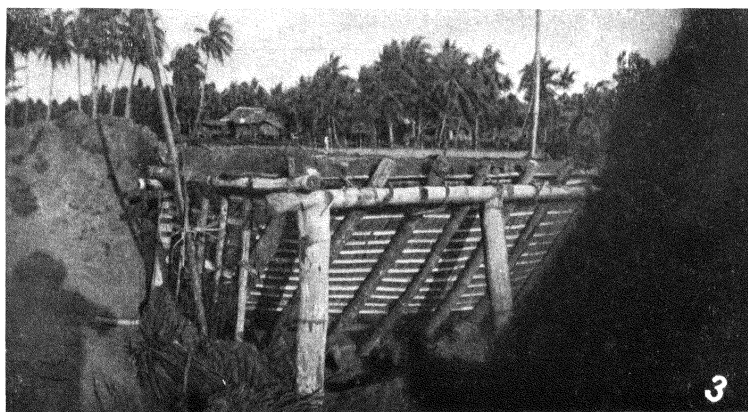
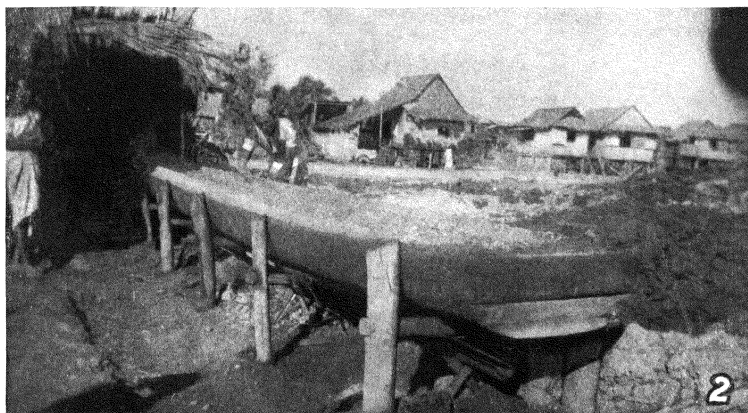
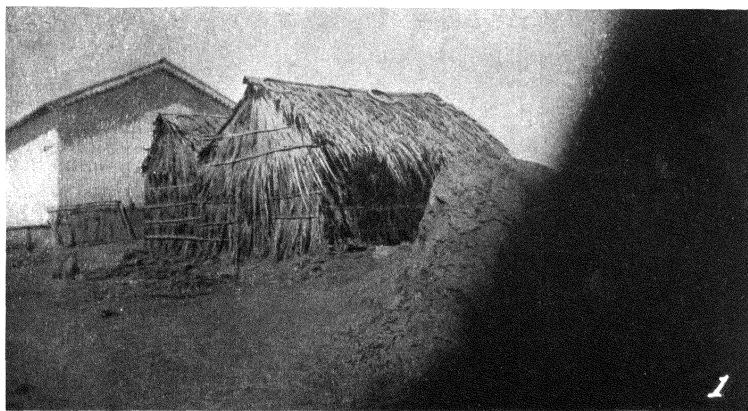


PLATE 3.

THE VALIDITY OF ARTOCARPUS CAMANSI BLANCO

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TWO PLATES

In the course of the preparation of illustrations for a proposed Flora of the Philippines, and particularly while preparing the drawings of "rimas" and "camansi," based on fresh specimens, the author has noted striking differences between these two previously much confused Philippine species of *Artocarpus*. While in appearance *Artocarpus camansi* is very similar to the form described by Blanco as *Artocarpus rima*, it differs in always producing fruits with numerous seeds, while *Artocarpus rima* Blanco (= *A. communis* Forst.) is always seedless. There are also striking differences in the anthocarps; in "rimas" these are flat and rounded, while in "camansi" they are narrowly conical, prolonged, and very conspicuous. Other important features are shown in Table 1. *A. camansi* Blanco should not be confused with the seeded *A. Blancoi* (Elmer) Merr., known here as "Antipolo," which is very distinct. "Antipolo" has slender and greatly prolonged anthocarps.

TABLE 1.—Comparison of *Artocarpus camansi* and *Artocarpus communis*.

Species.	Fruit.	Anthocarps.	Base of fruit.	Male inflorescence.	Stigmas.	Leaves.
<i>Artocarpus camansi</i> .	Seeded...	Narrowly conical, prolonged.	Rounded.	Club-shaped.	Elongated.	Usually four or five divisions on both sides.
<i>Artocarpus communis</i> .	Seedless...	Flat or rounded, slightly projecting.	Oblique.	Narrowly oblong-obovoid, thickened at middle.	Very short.	Usually three divisions on both sides.

While Blanco's type specimen is not extant (for he apparently preserved no botanical specimens), his species is so well known here and is so constantly recognized by Filipinos as "camansi" that no difficulty exists in interpreting the species.

ARTOCARPUS CAMANSI Blanco. Plate 1.

Artocarpus camansi BLANCO, Fl. Filip. (1837) 670 (*Archthocarpus*);
ibid. ed. 2 (1845) 467 (*Artocarpus*); ibid. ed. 3 3 (1879) 77, t.
457; F.-VILL. Novis. App. (1880) 202; MERRILL, Sp. Blancoanae
(1918) 124; Enum. Philip. Fl. Pl. 2 (1923) 40.

Blanco's original description is as follows:

Artocarpus Camansi.¹ *Artocarpus camansi*. Hojas anchas medio lanceoladas, algo asperas en ambas paginas, y con pelillos en las venas, con diez ó mas lobulos lanceolados que miran acia arriba Machos en espata monofila hendida en dos partes, que encierra un receptaculo comun largo, de figura de maza, cubierto de estambres. Filam casi nulos. Ant. de dos aposentos.

Hembras en un receptaculo comun oval ó globoso, crizado de puntas conicas, que cubren á los germenos; cada uno de estos con un estilo y dos estigmas revueltos á los lados. Cal. y Cor. propios ningunos. Fruto compuesto de infinitas semillas, como en la *Nangca*, rodeadas cada una de una piel membranacea.—Este arbol que no deja de ser conocido, es tan grande como el Antipolo. El fruto se hace mayor que la cabeza de un hombre: esta rodeado de aposentos, y en cada uno hai una semilla oval. Sus hojas son de dos pies de largo. Las semillas que son grandes como bellotas, se comen crudas ó cocidas, y tienen un sabor agradable parecido al de las castañas, y asi las llaman algunos: de las flores machos se hace dulce. Es indigeno de las Islas. Flor en Mayo. B, T, Dalañgian, Dolonggian, Camangsi. Y, Pacac.

Fernandez-Villar described *A. camansi* as follows:

Artocarpus camansi.² FOLIA lata sublanceolata, utraque pagina scabra, in venis pilosiuscula, 10-pluri-loba, lobis lanceolatis et sursum spectantibus. Masculorum spatha monophylla, bifida, receptaculum commune longum, clavatum, staminibus opertum, claudens. Filam. subnulla. anth. biloculares. Foemineorum receptac. commune ovale aut globosum, muricibus conicis, ovariaque tegentibus, vestitum. Ovar. 1-stylifera. Stigm. 2, lateralitèr revoluta. Cal. et cor. proprii o. Fructus polyspermus. Semina membrana vestita, etc. ut in *A. integrifolia*. Videtur varietas. *A. incisae*.

T. V. Dalañgian.—Doloñgian.—Camangsi.—

I. Pacac, Vid. Append. Gener.: ARTOCARPACEÆ.

Arbor indigena, 60-pluri-pedalis, nota. Fructus humano capite major, edulis.—Flor. mens. Maj.

Large trees with spreading crown, 10 to 15 m high, of the habit of *A. communis* (rimas). Leaves very large, ovate to oblong-ovate, coriaceous, 40 to 60 cm long, 25 to 45 cm wide, parenchyma bright dark green, nerves yellowish green, sparingly pubescent on both surfaces above, very pubescent on nerves

¹ Blanco, Flora de Filipinas (1837) 670.

² F.-Villar in Blanco, Flora de Filipinas ed. 3 3 (1879) 77.

beneath, acuminate, deeply pinnate, 4- to 5-lobed, lobes ovate, acute; petioles stout, very pubescent, 5 cm long or less; stipules large, deciduous, brown, pubescent, 10 to 12 cm long. Male spike club-shaped, curved at base, cylindric, greenish yellow, 15 to 25 cm long, 3 to 4 cm in diameter; peduncles 4 to 5 cm long, very pubescent. Anthers 2 to 2.5 mm long. Filaments 0.70 to 0.75 mm long. Female inflorescence ovoid or subglobose; peduncles pubescent. Style exerted; stigma 2-lobed, elongated; very prominent; fruit ovoid or subglobose, green, 10 to 15 cm long, 7 to 12 cm in diameter; peduncles pubescent, 5 to 6 cm long; tips of anthocarps narrowly conical, prolonged, 5 to 8 mm long, 5 mm thick or less at base. Seeds rather numerous, ovoid to subglobose, about 2.5 cm in diameter.

LUZON, cultivated in Manila, February, 1915, here known as *camansi* (Merrill: Species Blancoanae No. 830), Merrill, s. n. August, 1911; cultivated at Botanical Garden, For. Bur 19014 H. M. Curran, May 16, 1909; Cagayan Province, Tuguegarao, For. Bur. 18529 R. I. Alvarez, April 15, 1909. LEYTE, Ormoc, For. Bur. 11573 H. N. Whitford, March 13, 1909. CEBU, Bucacao, Bur. Sci. 11069 M. Ramos, March 12, 1912.

ARTOCARPUS COMMUNIS Forst. Plate 2.

Artocarpus communis FORST., Char. Gen. (1776) 102, t. 50-51a; MERRILL, Philip. Journ. Sci. 1 (1906) Suppl. 43; *ibid.* § C 3 (1908) 401; Fl. Manila (1912) 176; Sp. Blancoanae (1918) 123, 124; Enum. Philip. Fl. Pl. 2 (1923) 40; ELMER, Leaf. Philip. Bot. 2 (1909) 615.

Radermachia incisa THUNB., Vet. Akad. Handl. Stockh. (1776) 254.

Artocarpus incisa LINNÆUS, f., Suppl. (1871) 411; F.-VILL., Novis.

App. (1880) 202; VIDAL, Sinopsis Atlas (1883) 40, t. 88, f. B.; Rev.

Pl. Vasc. Filip. (1886) 254; MERRILL, Philip. Bureau Forest. Bull.

1 (1903) 17.

Artocarpus rima BLANCO, Fl. Filip. (1837) 671 (*Arcthocarpus*); *ibid.*

ed. 2 (1845) 467 (*Artocarpus*); *ibid.* ed. 3 3 (1879) 77, t. 267.

Rima SONN, Voy. Nouv. Guin. (1876) 99, t. 57-60.

Saccus communis O. K., Rev. (1891) 633.

It is noted that *Artocarpus communis* Forst. and *Radermachia incisa* Thunb. were published in the same year, and that it may not be possible to determine which specific name was first published. Under the circumstances Forster's binomial is retained, first because it supplies the oldest specific name under *Artocarpus*, and second because Forster's description is illustrated by two good plates. If it could be proved that *Radermachia incisa* Thunb. was actually published before Forster's work appeared, *A. incisa* (Thunb.) Linn. f. would be the ac-

cepted name. Attention is called to the fact that there is a generic name older than either *Artocarpus* or *Radermachia*, in *Sitodium*; ³ in botanical literature the actual publication of *Sitodium* has been hitherto credited to Gaertner.⁴ *Artocarpus* Forst. is the name recommended for conservation; see Fosberg, loc. cit.

The breadfruit was originally described from specimens apparently taken from planted trees in Polynesia, where the species seems manifestly to be an introduced one. In Polynesia a very large number of varieties are recognized by the local residents, but the variations represent horticultural rather than botanical values, and it scarcely seems to be desirable to even propose varietal (trinomial) names for these numerous forms of what is, after all, a cultigen. We do not know that the wild form of the breadfruit (*Artocarpus communis* Forst.) is known, but it may reasonably be assumed to be derived, by selection, from some species perhaps even approximating the "camansi," which, however, seems manifestly to be specifically distinct from *A. communis* Forst. as that species is currently interpreted.

³ Parkinson, Journ. Voy. Endeavour 45 (1773) (see Fosberg, Am. Journ. Bot. 27 (1939) 231.

⁴ Fruct. 1 (1788) t. 71, 72.

ILLUSTRATIONS

PLATE 1

Artocarpus camansi Blanco. Fig. 1, habit, very much reduced; 2, male spike, reduced; 3, transverse section of male spike, showing details of stamens, very much enlarged; 4, view from above of a portion of male spike, showing anthers and perianth, very much enlarged; 5, a young female inflorescence, much reduced; 6, transverse section of a young female inflorescence, showing anthocarps with prolonged, narrowly, conical tips, and bilobed stigmas, very much enlarged; 7, fruit in section, reduced; 8, seed with core and wall intact, slightly reduced; 9 and 10, seeds with the wall and core removed, slightly reduced.

PLATE 2

Artocarpus communis Forst. Fig. 1, habit, very much reduced; 2, male spike, reduced; 3, transverse section of male spike, showing stamens very much enlarged; 4, view from above of a portion of male spike, showing anthers and perianth, very much enlarged; 5, transverse section of a young female inflorescence, showing flat or rounded tips of anthocarps and inconspicuous stigmas, much enlarged; 6, whole fruit, much reduced; 7, a fruit in section, much reduced.

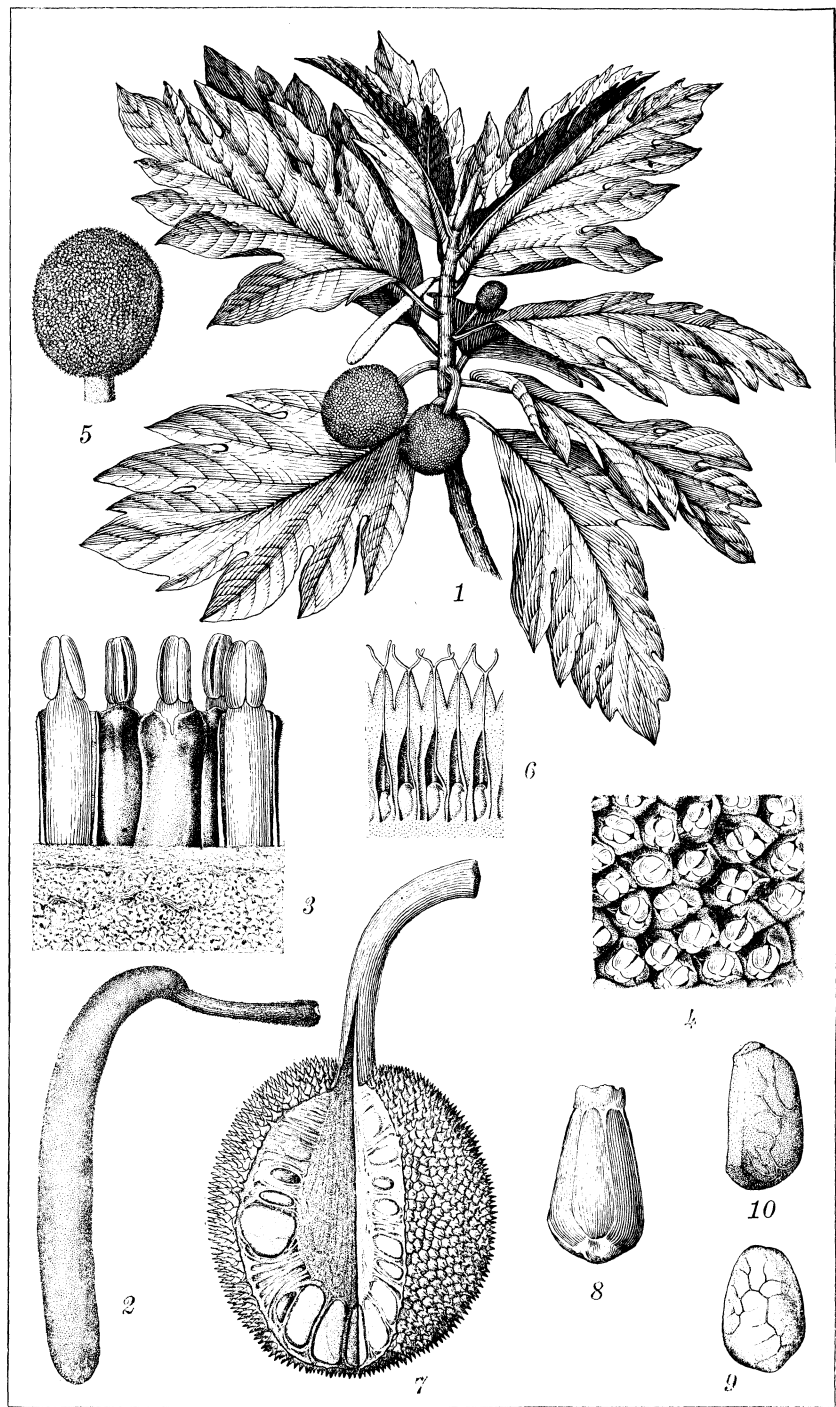


PLATE 1. ARTOCARPUS CAMANSI BLANCO.

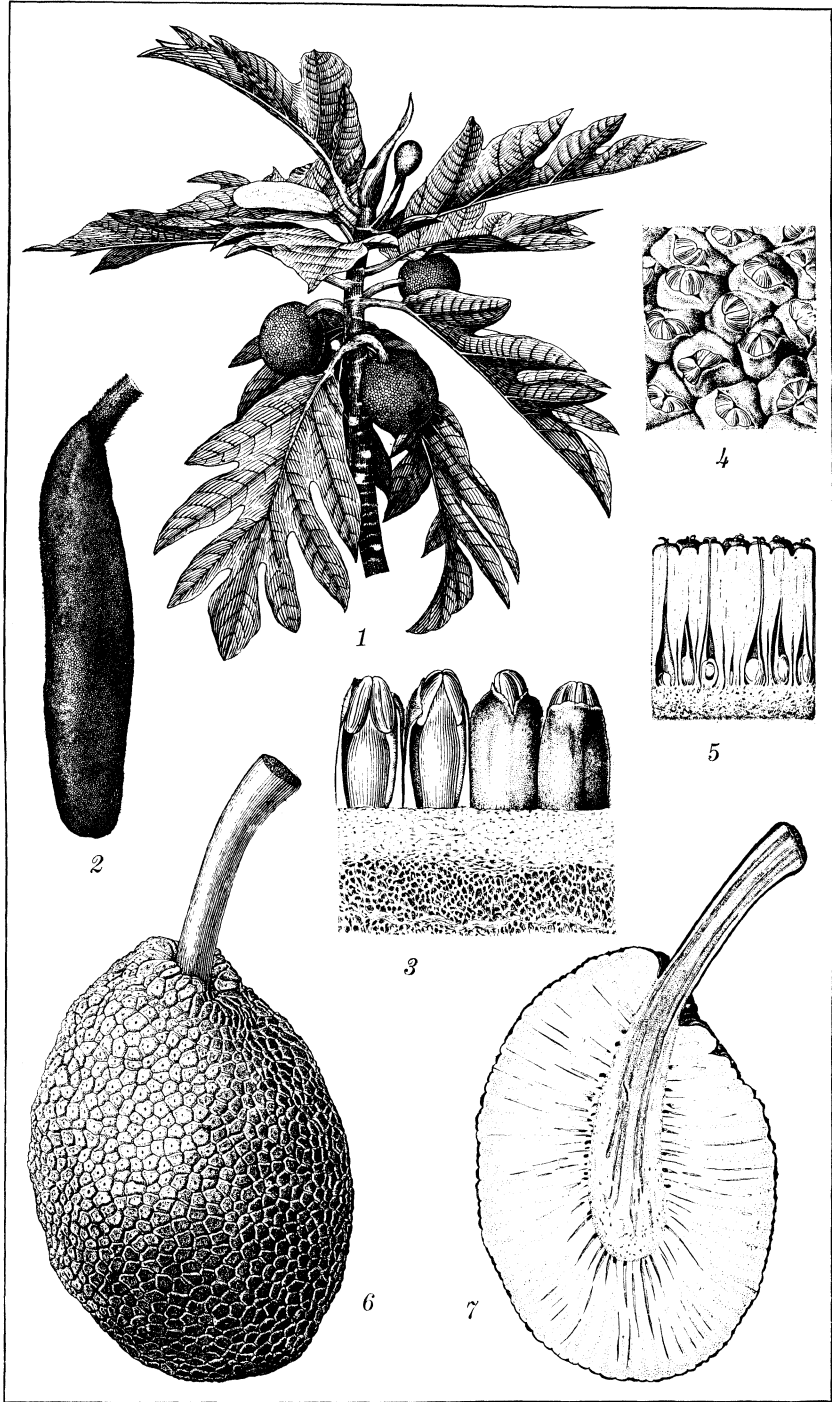


PLATE 2. ARTOCARPUS COMMUNIS FORST.

A REVISION OF THE GENUS PSALLIOTA IN THE PHILIPPINES

By JOSÉ MIGUEL MENDOZA and SIMEONA LEUS-PALO

Of the Natural History Museum Division, Bureau of Science, Manila

EIGHT PLATES

The nomenclatural confusion in the identification of some of the Philippine *Psalliota*, with its increasing number of species and their economic importance, all species being edible—makes it imperative that this genus be subjected to a thorough revision.

Agaricus argyrostictus Copeland in the Philippines is *Psalliota campestris* var. *radicata* Bresadola in Europe. Since the advent of the American regime in the Philippines many American species of this genus have been discovered here. *Psalliota arvensis*, commonly known as horse mushroom in the United States, and *Psalliota campestris* var. *umbrina* have been found near stables where army horses are kept. Current advertisements have been put up in many American magazines and papers on mushroom culture, and the enthusiasm for this occupation reached the Philippines. Spawns of *Psalliota campestris* have been ordered from abroad, and its culture tried in the Philippines. Unfortunately, due to the difficulty of maintaining a suitable temperature, and because of lack of proper knowledge regarding the culture of this mushroom, none of these projects has been successful. Local interest in the growing of mushrooms has therefore faded away gradually, but the introduction of *Psalliota campestris* into this country by this means cannot be denied. In Pasig, Rizal Province, large quantities have been collected very recently.

The genus *Agaricus* was founded¹ by Linnæus to include all agarics having spores of various colors; gills membranaceous, persistent, with an acute edge; trama floccose, putrifying and not reviving when once dried. Later Fries² changed the name *Agaricus* to *Psalliota* to include only agarics with purple, reddish

¹ Syst. Nat. (1736) 387.

² Syst. Myc. 1 (1821) 280.

spores, more or less fleshy plants, and free gills. The stem is central, with a membranaceous ring. The interpretation of Fries is adopted in this paper.

Genus PSALLIOTA Fries

Psalliota FRIES, Hym. Eur. (1874) 278; PECK, N. Y. Mus. Rept. 36 (1894) 41; KAUFFMAN, Agar. Mich. 1 (1918) 232; REA, Brit. Basid. (1922) 82; BRESADOLA, Icon. Myc. 17 (1931) 45; MENDOZA, Philip. Journ. Sci. 65 (1938) 82.

Agaricus LINNÆUS, Syst. Nat. 5 (1735) 327; SACCARDO, Syll. Fung. 5 (1887) 993.

Pileus fleshy, convex, at length flattened, for the most part white to grayish yellow or dark, often scaly; gills crowded, free, white to rosy white, then tobacco-colored to dark purple; stipe fleshy, central, stuffed to hollow; annulus membranaceous, more or less persistent; volva absent; spores ellipsoid to ovoid, smooth, rose-colored to dark brown, dark purple.

All species are terrestrial, decaying, and edible.

Key to the Philippine species of *Psalliota*.

- a*¹. Small; pileus thin, normally less than 3 cm broad.
 - b*¹. Growing on open, grassy plains, sometimes forming fairy rings.
 - 11. *P. perfuscus*.
 - b*². Growing under trees or banana groves, never forming fairy rings.
 - c*¹. Pileus with pinkish to reddish-brown hue, tinged with gray.
 - 8. *P. diminutiva*.
 - c*². Pileus creamy-white, with reddish stains..... 7. *P. comtula*.
- a*². Large; pileus thick, normally more than 4 cm broad.
 - b*¹. Pileus on top decidedly truncate..... 10. *P. merrillii*.
 - b*². Pileus on top not decidedly truncate.
 - c*¹. Spores large, 12 to 14 μ long, 6.3 to 8.4 μ broad..... 13. *P. villatica*.
 - c*². Spores small, 5.4 to 7.5 μ long, 4.2 to 5 μ broad, 8.4 to 9 μ , long, 4 to 5 μ broad.
 - d*¹. Pileus white, smooth to floccose.
 - e*¹. Bulbous at base 1. *P. abruptibulba*.
 - e*². Not bulbous at base..... 2. *P. arvensis*.
 - d*². Pileus colored, rough, covered with fibrils or scales.
 - e*¹. Mushrooms not deeply rooted.
 - f*¹. Pileus covered with fine, reddish fibrils..... 9. *P. luzoniensis*.
 - f*². Pileus covered with minute, brown scales.. 12. *P. placomyces*.
 - f*³. Pileus silky, floccose or hairy-scaly..... 3. *P. campestris*.
 - f*⁴. Pileus covered with large, sharp, pointed, brown scales.
 - 6. *P. campestris* var. *umbrina*.
 - e*². Mushrooms deeply rooted.
 - f*¹. Pileus smoky gray, covered with sooty scales.
 - 5. *P. campestris* var. *radicata*.
 - f*². Piles grayish, tinged with yellow..4. *P. campestris* var. *edulis*.

1. *PSALLIOTA ABRUPTIBULBA* Peck. Plate 1, fig. 1.

Psalliota abruptibulba PECK in Hard, Mushrooms (1908) 213; MARSHALL, Mushrooms (1905) 77; KAUFFMAN, Agar. Mich. 1 (1918) 237; KRIEGER, N. Y. Ste. Mus. Hdbk. (1935) 420.

Agaricus abruptus PECK, N. Y. Ste. Mus. Mem. 4 (1900) 201.

Agaricus silvicola VITTADINI in Atkinson, Mushrooms (1900) 22.

Pileus convex, later expanded-plane, dry, brittle, smooth, often-times covered with white, appressed, silky fibrils, at times with appressed scales, silky, shiny, white or creamy white, often with dirty-yellowish stains, 6 to 14 cm broad. Gills free, crowded to remote, narrow, white when very young, soon pink, then dark brown; edge entire. Stipe stuffed, later hollow, nearly smooth, cylindrical or tapering upward, sometimes slender, white to yellowish in age or when bruised, 8 to 16 cm long, 7 to 16 mm broad. Annulus thick, smooth, later cracking below, yellowish, evanescent. Spores smooth, elliptical, dark purple, 5.4 to 7.5 μ long, 4.2 to 5 μ broad. Flesh thick, turning yellowish in age or when bruised. Odor and taste pleasant.

LUZON, Manila, *Philip. Not. Herb.* 1301, 1307, 1548 *P. S. Gener.* On the ground among leaves under trees and in thickets.

2. *PSALLIOTA ARVENSIS* Schaeffer. Plate 1, fig. 2.

Psalliota arvensis SCHAEFFER in Kauffman, Agr. Mich. 1 (1918) 236; REA, Brit. Basid. (1922) 84; McDougall, Mushrooms (1925) 71; KRIEGER, N. Y. Ste. Mus. Hdbk. 11 (1935) 422.

Agaricus arvensis SCHAEFFER, Ic. Bav. 4 (1862) 72; Fries, Hym. Eur. (1874) 278; COOKE, Ill. Brit. Fung. 5 (1886) 523.

Agaricus exquisitus VITTADINI, Fung. Mang. (1835) 146.

Pileus fleshy, globose, conical to campanulate, later expanded, at first cottony to mealy, then smooth, somewhat shiny, white-gray, sometimes stained with yellowish to greenish shading, smooth to more or less channelled, 7 to 14 cm broad. Gills strongly crowded, dry, round and free at the center, pale pinkish, then blackish brown; edge entire. Stipe stout, stuffed to hollow, glabrous, 4 to 18 cm long, 8 to 25 mm thick. Annulus thick, consisting of two layers, below more or less cracked, nearly persistent. Spores ellipsoid, smooth, purplish brown, blackish in mass, 8.4 to 9 μ long, 4 to 5 μ broad. Basidia clavate, 15 to 20 μ long, 4.5 to 5 μ broad.

LUZON, Rizal Province, Alabang, *Philip. Nat. Herb.* 2751, 2791 *J. M. Mendoza.* On the ground near army horse stables.

3. *PSALLIOTA CAMPESTRIS* (Linn.) Fries. Plate 2, fig. 1.

Psalliota campestris FRIES, Epicr. (1836) 213; Hym. Eur. (1874) 279; ATKINSON, Mushrooms (1900) 2; HARD, Mushrooms (1908)

307; REA, Brit. Basid. (1922) 87; KAUFFMAN, Agar. Mich. 1 (1918) 240; BRESADOLA, Icon. Myc. 17 (1931) 823; KRIEGER, N. Y. Ste. Mus. Hdbk. 11 (1935) 423; MENDOZA, Philip. Journ. Sci. 65 (1938) 82, 83.

Agaricus campester LINNÆUS in Saccardo, Syll. Fung. 5 (1887) 997; Fl. It. Crypt. Hym. (1915) 799.

Agaricus campestris LINNÆUS in Cooke, Hdbk. Brit. Fung. (1871) 137; FRIES, Syst. Myc. 1 (1821) 281; COOKE, III. 5 (1886) 528.

Pileus fleshy, white or brownish, at first hemispherical or convex, later expanded; margin nearly plane or recurved, often torn or fringed, extended beyond gills, smooth, silky-floccose or hairy-scaly, 5 to 14 cm broad or broader. Gills free, crowded, ventricose, at first pink, becoming chocolate to brownish or brown in age. Stipe white or nearly white, firm, bulbous when young, later almost equal, stuffed, somewhat smooth, squamulose, 4 to 10 cm long, 1 to 2.5 cm thick. Annulus white, fugaceous, membranaceous, sometimes in the form of a cortina, torn, sheathed middle. Spores broadly elliptical, purplish brown, 5 to 8 μ long, 4 to 6 μ broad.

Flavor and taste very pleasant.

LUZON, Rizal Province, Pasig, *Philip. Nat. Herb.* 2614, 2623 *J. M. Mendoza*. On the ground in rotting palay husk.

4. *PSALLIOTA CAMPESTRIS* (Linn.) Fries var. *EDULIS* Vittadini. Plate 2, fig. 2.

Psalliota campestris Fries var. *edulis* VITTADINI, Fung. Mang. (1836) 41; BRESADOLA, Icon. Myc. 17 (1931) 825; MENDOZA, Philip. Journ. Sci. 65 (1938) 83.

Agaricus campestris LINNÆUS in Adriano, Philip. Journ. Agr. 4 (1935) 2.

Pileus fleshy, globose, convex-expanded, often decorated with cracks which are sometimes longitudinal in form, white, tinged for the most part with yellow, 3 to 8.5 cm broad. Gills very crowded, sinuate to nearly free at the center, rosy white, at length dark brown. Stipe stuffed, stout, often abruptly tapering and rooted at base, concolorous with pileus, smooth, covered with minute scales above ring, 3 to 5 cm long, 1.5 to 2 cm in diameter. Annulus double, at first broad, later turned up, white, hairy, becoming smooth above, furrowed, membranaceous at base. Spores broad, ellipsoid, flesh to dark-colored, smooth, 7 to 8 μ long, 5 to 6 μ broad.

LUZON, Laguna Province, Los Baños, *Bur. Sci.* 55646 *F. Adriano*. On the ground in pastures.

5. *PSALLIOTA CAMPESTRIS* (Linn.) Fries var. *RADICATA* Vittadini. Plate 2, fig. 3.

Psalliota campestris Fries var. *edulis* VITTADINI, Fung. Mang. 11 (1835); BRESADOLA, Icon. Myc. 17 (1931) 827.

Agaricus argyrostictus COPELAND, Ann. Myc. 3 (1905) 144; BROWN, Minor Prod. Philip. For. 3 (1921) 132.

Pileus fleshy, hemispherical to subcampanulate, depressed when expanded, white, smoky gray, silky, covered at the center with adpressed, sooty scales, 6 to 11 cm broad. Gills free, from rosy to dark purple, round and free at back. Stipe stuffed with cottonlike substance, sometimes hollow, white, fibrillose, striated above annulus, tinged with yellow below, 3 to 6.5 cm long, 0.8 to 2 cm broad, about 3 cm in diameter at base. Annulus superior, not broad, white, substriate at first, later shaggy. Spores ellipsoid to ovoid, smooth, dark purple, 5 to 9.5 μ long, 5 to 6 μ broad. Basidia clavate, 23 to 32 μ long, 6 to 7.5 μ broad. Flesh white, pinkish near gills, compact in pileus, fibrous in stipe. Odor and flavor pleasant.

LUZON, Laguna Province, Los Baños, *Philip. Nat. Herb.* 2072, 2124, *Bur. Sci.* 55905 J. M. Mendoza, *Bur. Sci.* 55789 E. Roldan: Rizal Province, Alabang, *Philip. Nat. Herb.* 2527, 2569 J. M. Mendoza. On the ground among leaves under trees.

6. *PSALLIOTA CAMPESTRIS* (Linn.) Fries var. *UMBRINA* Fries. Plate 3.

Psalliota campestris Fries var. *umbrina* FRIES, Hym. Eur. (1874) 279; GRESADOLA, Icon. Myc. 17 (1931) 826; MENDOZA, Philip. Journ. Sci. 65 (1938) 83, 84.

Agaricus vaporarius VITTADINI, Fung. Mang. (1836) 42.

Pileus compact, fleshy, convex, subglobose, later plane, umbonate, at first covered with a thin layer of fine fiber which later becomes fringed, sharp-pointed, scalelike, 5 to 10 cm in diameter. Gills free, crowded, round at base, at first white, pale yellow to flesh-colored, later tobacco-colored to dark. Stipe stuffed, later slightly hollow, nearly equal, sometimes tapering toward apex, 3 to 6 cm long, 1 to 2.5 cm in diameter, color below similar to that of cap, sometimes later paler, covered with fine fibrils, later becoming smooth; white to lightly colored above, somewhat powdery on surface. Annulus white on upper portion, brown below, more or less lasting. Flesh white, pale yellow to faint brick-red. Spores broadly ellipsoid, dark, smooth, 6 to 7.5 μ long, 3 to 4.5 μ broad. Basidia clavate, 24 to 31 μ long, 6 to 8.6 μ broad.

Odor pleasant, taste agreeable.

LUZON, Rizal Province, Alabang, *Philip. Nat. Herb.* 2484, 2485, 2495, 2524, 2525, 2594 J. M. Mendoza. On the ground among leaves under trees and in thickets.

7. *PSALLIOTA COMTULA* Fries. Plate 4.

Psalliota comtula FRIES, Epicr. (1836) 215; Hym. Eur. (1874) 281; KAUFFMAN, Agar. Mich. 1 (1918) 244; REA, Brit. Basid. (1922) 90; BRESADOLA, Icon. Myc. 17 (1931) 833; MENDOZA, Philip. Journ. Sci. 65 (1938) 84.

Agaricus comtulus SACCARDO, Syll. Fung. 5 (1877) 1006; COOKE, Ill. Brit. Fung. 5 (1886) 536.

Pileus at first convex to nearly expanded, subumbonate, silky, creamy to grayish white, more or less tinged with yellowish spots on margin, 2 to 4 cm broad. Gills crowded, ventricose, round and free at center, flesh white at first, later smoky amber. Stipe nearly cylindrical, hollow, silky, pale or slightly stained with yellowish, 3 to 5 cm long, 2 to 5 mm thick. Annulus membranaceous, thin, whitish, easily disappearing. Spores smooth, elliptical, purple-brown, 4 to 5 μ long, 3.5 to 4 μ broad. Flesh whitish, becoming ochraceous in age.

Odor not distinct, taste agreeable.

LUZON, Bataan Province, Lamao Agr. Exp. Station, *Bur. Sci.* 55197 J. M. Mendoza: Laguna Province, Mount Maquiling, *Bur. Sci.* 55728 J. M. Mendoza: Manila, *Philip. Nat. Herb.* 1923, *Bur. Sci.* 55555 P. S. Gener; *Philip. Nat. Herb.* 2487, *Bur. Sci.* 55596 J. M. Mendoza. Growing on the ground under trees and under banana plants.

8. *PSALLIOTA DIMINUTIVA* Peck. Plate 5, fig. 1.

Psalliota diminutiva PECK, N. Y. State Mus. Rept. 26 (1874) 59; KAUFFMAN, Agar. Mich. 1 (1918) 245; KRIEGER, Ste. Mus. Hdbk. 11 (1935) 425.

Pileus fragile, at first convex, later plane, sometimes depressed, white, tinged with gray, silky to fibrillose, fibrils forming pinkish, reddish-brown scales at center, paler and smooth at margin, 2 to 4.5 cm broad. Gills free, moderately crowded, thin, broad, ventricose; edge entire. Stipe whitish, equal or tapering upwards, sometimes nearly bulbous at base, later hollow, sometimes silky, 2.5 to 5 cm long, 2 to 5 mm in diameter. Annulus thin, narrow, whitish, more or less permanent. Spores elliptical, smooth, purple brown in mass, 4.8 to 6 μ long, 3 to 3.6 μ broad. Flesh thin, whitish.

Odor and taste agreeable.

LUZON, Laguna Province, Mount Maquiling, *Bur. Sci.* 55728 J. M. Mendoza: Manila, *Philip. Nat. Herb.* 1264 P. S. Gener, *Philip. Nat. Herb.* 2501 J. M. Mendoza. On the ground among leaves under trees.

9. PSALLIOTA LUZONIENSIS (Graff) comb. nov. Plate 6, fig. 1.

Agaricus luzoniensis GRAFF, Philip. Journ. Sci. § C 9 (1914) 235; BROWN, Minor Prod. Philip. For. 1 (1921) 132; MENDOZA, Philip. Journ. Sci. 65 (1938) 84.

Pileus fleshy, thick at center, thin at margin and covered with some remnants of veil, convex, later expanded, white, smooth and reddish brown at center, rest covered with fine reddish fibrils, 6 to 10 cm broad. Gills white when young, becoming dark brown in age, free, moderately broad, crowded, rounded at back. Stipe long, light brown, floccose above annulus; white, smooth to fibrous below, swollen at base, 12 to 20 cm long, 5 to 10 mm in diameter. Annulus membranaceous, permanent, well up on stipe. Spores elliptical, 5 to 5.5 μ long, 2.4 to 3.5 μ broad, dark brown in mass. Basidia clavate, 18 to 20 μ long, 4.5 to 5 μ broad.

Odor and taste pleasant.

LUZON, Manila, *Bur. Sci.* 21661 P. W. Graff (type in Philip. Nat. Herb.); *Philip. Nat. Herb.* 2827 B. Reyes. On the ground among leaves under trees.

10. PSALLIOTA MERRILLII (Copel.) comb. nov. Plate 7.

Agaricus merrillii COPELAND, Ann. Myc. 3 (1905) 27; New Sp. Philip. Edib. Fung. Govt. Lab. Publ. 28 (1905) 144; BROWN, Minor Prod. Philip. For. 3 (1921) 134; MENDOZA, Philip. Journ. Sci. 65 (1938) 85.

Pileus naked, fleshy, thick, often scaly, white, later brown, shiny, truncate, broadly round at apex when young, becoming plane in age, 8 to 12 cm broad. Gills free, round at back, numerous crowded, broad, nearly sharp at edge, at first salmon-colored, finally turning dark or blackish. Stipe whitish, later turning brown, stout, abruptly enlarged at base, somewhat contracted at upper portion, 9 to 11 cm long, 7 to 10 mm in diameter. Annulus easily torn, often just hanging, located high up on stem. Spores elliptical, uninucleate, dark brown in mass, with purplish tinge, 5 to 7 μ long, 3 to 3.5 μ broad. Basidia clavate, 13.5 to 18 μ long, 3.6 to 5.1 μ broad.

Color and taste pleasant.

LUZON, Laguna Province, Los Baños, *Bur. Sci.* 55853 J. M. Mendoza: Manila, *Philip. Nat. Herb.* 1261, 1893, 2617, *Bur. Sci.* 55170 P. S. Gener, *Philip. Nat. Herb.* 2616 B. Reyes, *Philip. Nat. Herb.* 2620 G. Edaña, *Philip. Nat. Herb.* 1269, 2618, 2624 J. M. Mendoza: Rizal Province, Fort William McKinley, *Bur. Sci.* 55578 J. M. Mendoza. Growing on the ground under trees.

11. *PSALLIOTA PERFUSCUS* (Copel.) comb. nov. Plate 8.

Agaricus perfuscus COPELAND, Ann. Myc. 3 (1905) 28; New Sp. Edib. Fung. Govt. Lab. Publ. 28 (1905) 145; BROWN, Min. Prod. Philip. For. 3 (1921) 134; MENDOZA, Philip. Journ. Sci. 65 (1938) 85.

Pileus round when young, white to creamy, becoming brown to dark brown in age, early expanded, disc slightly depressed, covered with very fine scales, margin strongly appendaged, 2 to 6 cm broad. Gills free, crowded, rounded on both ends, pale pink when young, later pink, soon becoming brown to dark brown because of the color of the spores in mass. Stipe equal, firm, hollow, at first white, later assuming color of cap, 3 to 5 cm long, 3 to 5 mm in diameter. Annulus way up on stem, early disappearing. Spores elliptic, dark brown in mass, 6 to 7.5 μ long, 4.2 to 5.1 μ broad. Basidia clavate, 21 to 24 μ long, 6 to 6.6 μ broad.

Odor and taste pleasant.

LUZON, Bataan Province, Lamao Agricultural Experiment Station, *Bur. Sci.* 55181 J. M. Mendoza; Manila, *Philip. Nat. Herb.* 1271 P. S. Gener, *Philip. Nat. Herb.* 2537, 2621 J. M. Mendoza; Rizal Province, Alabang, *Philip. Nat. Herb.* 2478, 2567 J. M. Mendoza; San Juan Heights, *Philip. Nat. Herb.* 1087 E. Basaca, *Philip. Nat. Herb.* 2792 B. Reyes; Fort William McKinley, *Bur. Sci.* 55600 J. M. Mendoza. NEGROS, Occidental Negros Province, Silay, *Philip. Nat. Herb.* 2622 M. Unson. Growing on leaves and in other grassy places.

12. *PSALLIOTA PLACOMYCES* (Peck) Kauffman. Plate 6, fig. 2.

Psalliota placomyces KAUFFMAN, Agar. Mich. 1 (1918) 238; KRIEGER, N. Y. State Mus. Hdbk. 11 (1935) 426.

Agaricus placomyces PECK, N. Y. State Mus. Rep. 28 (1878) 40; SACCARDO, Syll. Fung. 5 (1887) 1003; ATKINSON, Mushrooms (1911) 23; McDOUGALL, Mushrooms (1926) 70.

Agaricus manilensis COPELAND, Ann. Myc. 3 (1905) 28; New Sp. Philip. Edb. Fung. Govt. Lab. Publ. 28 (1905) 145; BROWN, Minor Prod. Philip. For. 3 (1921) 134.

Pileus thin, fleshy, convex to campanulate when young, later expanded and plane, sometimes umbonate, covered with minute scales which are more dense towards center; whitish, becoming brown in age because of the color of the scales; 5 to 11 cm broad. Gills crowded, free, white, then pinkish, finally dark brown. Stipe smooth, whitish, bulbous; bulb stained with yellow, stuffed, then hollow, 6 to 11 cm long, 4 to 7 mm thick. Annulus way up on stem, thin, more or less flappy. Spores elliptical, smooth,

purplish brown, blackish brown in mass, 5 to 6.5 μ long, 3.5 to 4.5 μ broad.

LUZON, Rizal Province, Mariquina, *Philip. Nat. Herb.* 2752, 2790 S. R. Capco and S. Chico. On the ground among leaves under trees.

13. *PSALLIOTA VILLATICA* (Brond.) Bresadola. Plate 5, fig. 2.

Psalliota villatica BRESADOLA, *Icon. Myc.* 17 (1931) 829.

Agaricus villaticus BROND., *Gr. Ag.* (1829) 26; FRIES, *Hym. Eur.* (1874) 280; SACCARDO, *Syll. Fung.* 5 (1887) 999.

Pileus fleshy, globose to nearly ovate, later convex to plain, lurid to straw-colored, silky, at length covered with dark-tawny scales; margin hairy, extending beyond gills, 8 to 19 cm broad. Gills very crowded, white at first, then rosy flesh, later dark brown, blackening. Stipe solid, stuffed, base ventricose to nearly bulbous, tapering upward, concolorous with pileus, scaly to cottony, scales straw-colored to yellow, at length disappearing, 4 to 8 cm long, 1 to 2.5 cm in diameter. Annulus way up on stem, broad, smooth above, appearing yellow below because of the hairy to cottony ornamentation. Spores ellipsoid, apiculate, guttulate, light, dark purple to dark brown, 12 to 14 μ long, 6.3 to 8.4 μ broad. Basidia clavate, 24 to 31 μ long, 8 to 12 μ broad. Flesh white. Stipe when bruised ochraceous to brick-red.

Odor rather unpleasant, taste almondlike.

LUZON, Bulacan Province, Norzagaray, *Philip. Nat. Herb.* 1355, *Bur. Sci.* 55889 P. S. Gener. On the ground under trees.

ILLUSTRATIONS

PLATE 1

- FIG. 1. *Psalliota abruptibulba*; $\times 0.75$.
2. *Psalliota arvensis*; $\times 0.6$.

PLATE 2

- FIG. 1. *Psalliota campestris*; $\times 0.7$.
2. *Psalliota campestris* var. *edulis*; $\times 0.9$.
3. *Psalliota campestris* var. *radicata*; $\times 0.9$.

PLATE 3. *Psalliota campestris* var. *umbrina*; $\times 0.8$.

PLATE 4. *Psalliota comtula*; $\times 1.1$.

PLATE 5

- FIG. 1. *Psalliota diminutiva*; $\times 1$.
2. *Psalliota villatica*; $\times 1$.

PLATE 6

- FIG. 1. *Psalliota luzoniensis*; $\times 0.7$.
2. *Psalliota placomyces*; $\times 0.9$.

PLATE 7. *Psalliota merrillii*; $\times 0.8$.

PLATE 8. *Psalliota perfuscus*; $\times 1.5$.

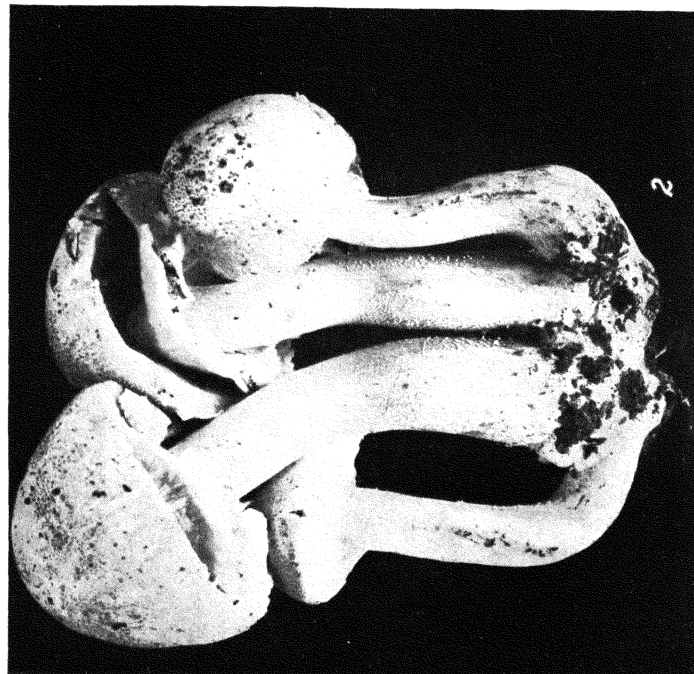
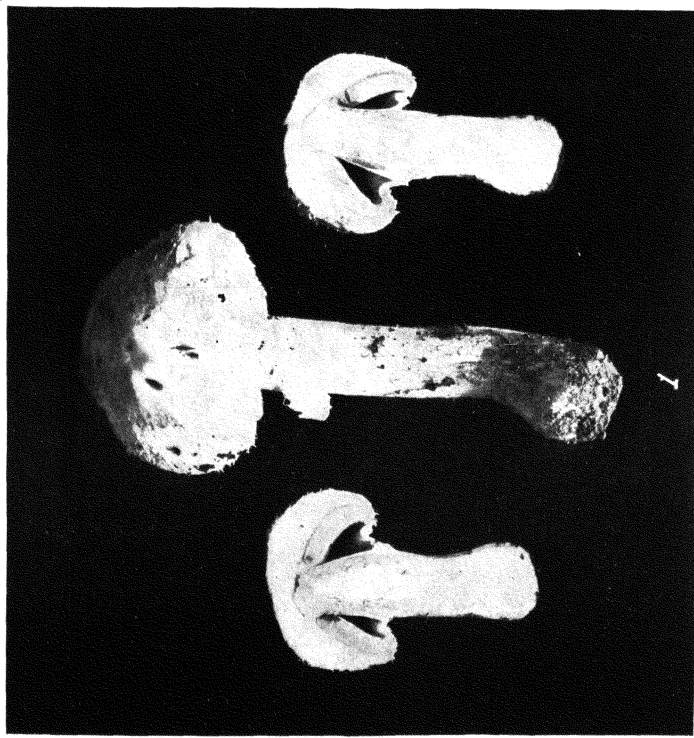


PLATE 1.

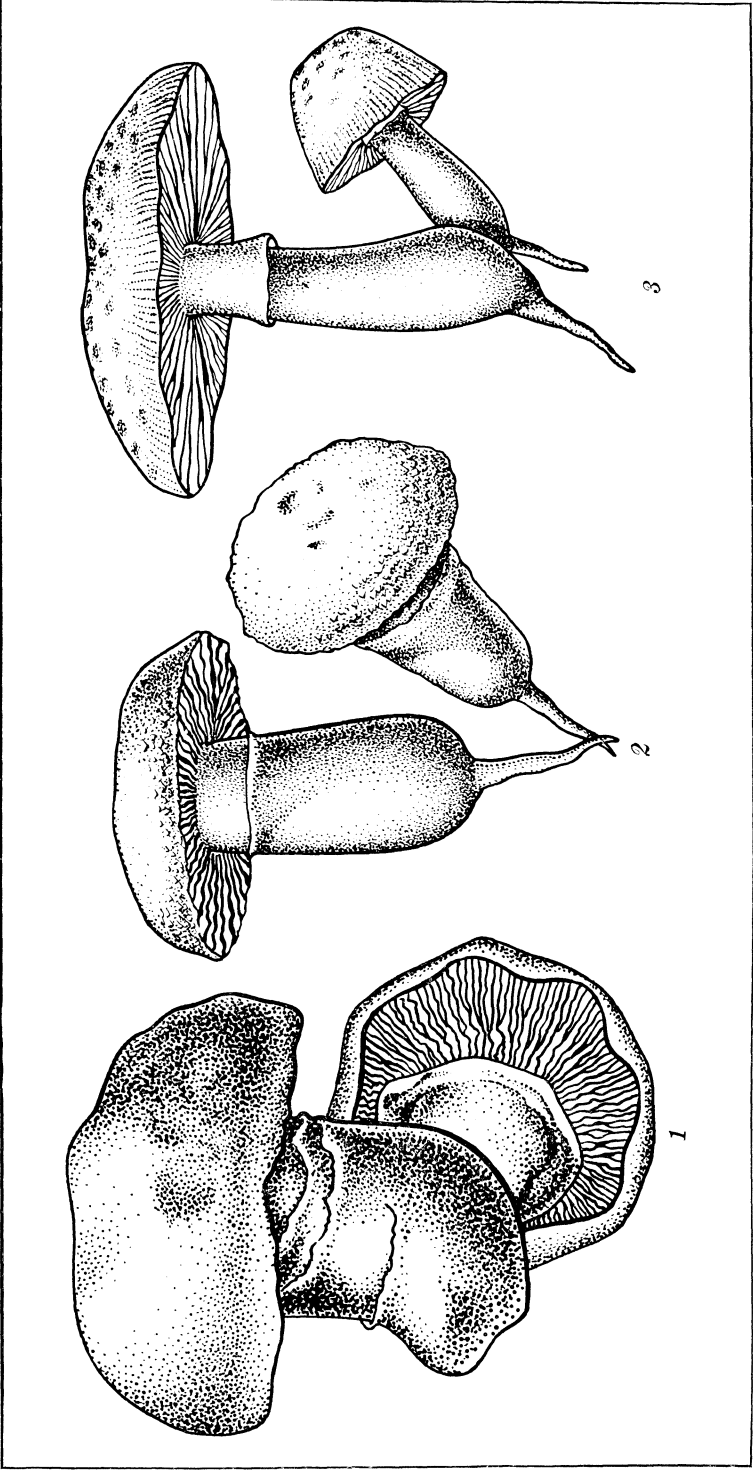


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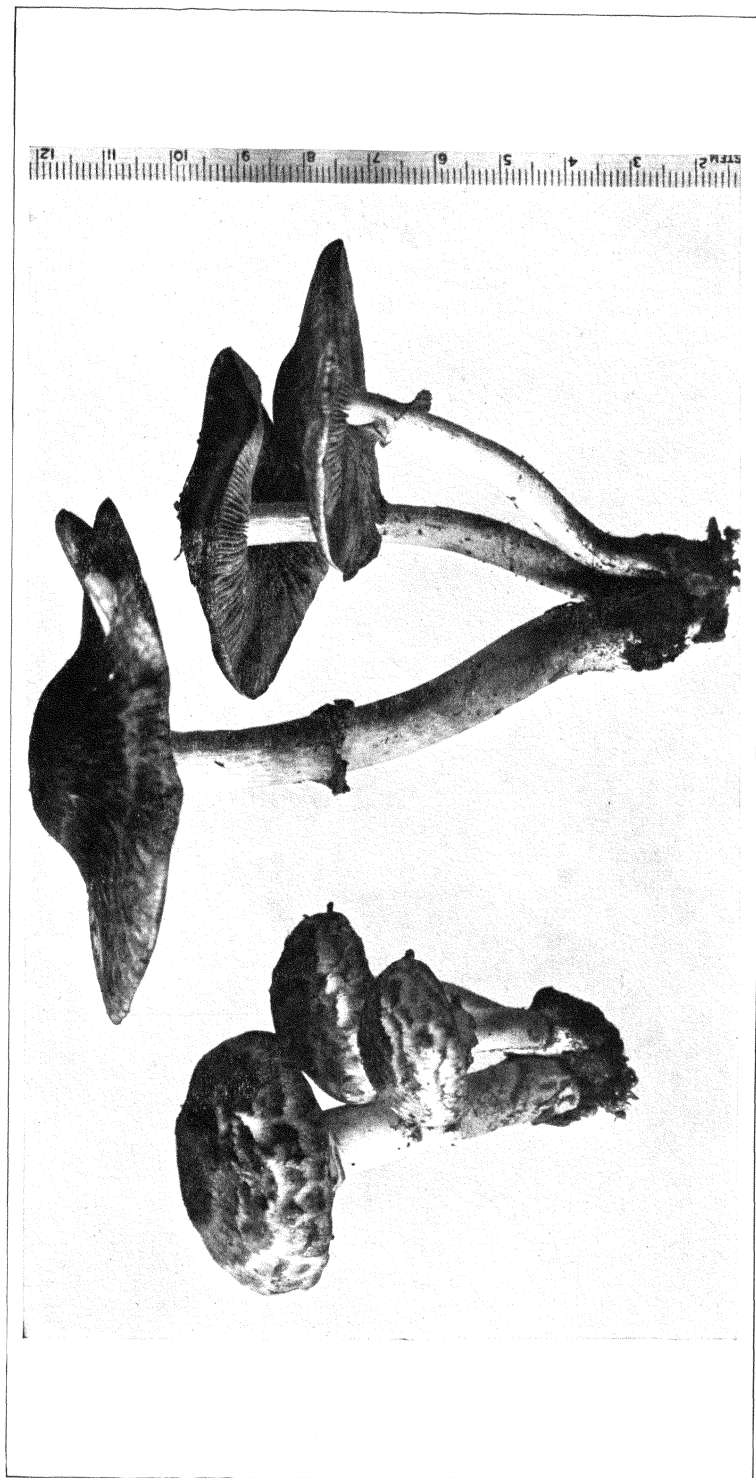


PLATE 3.

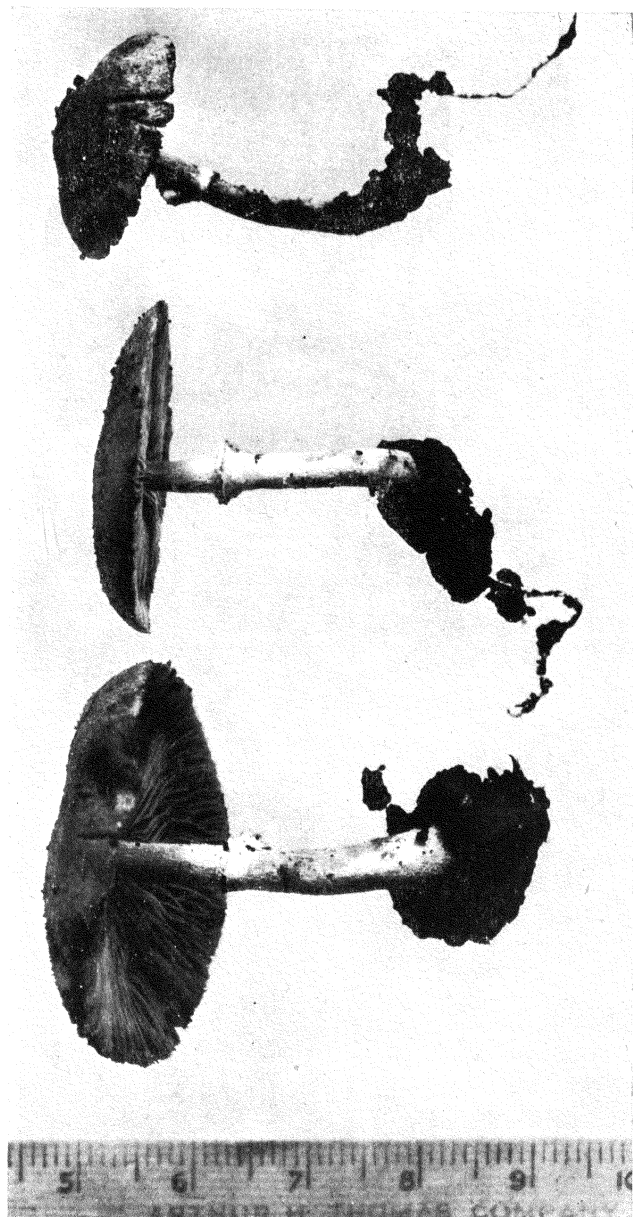
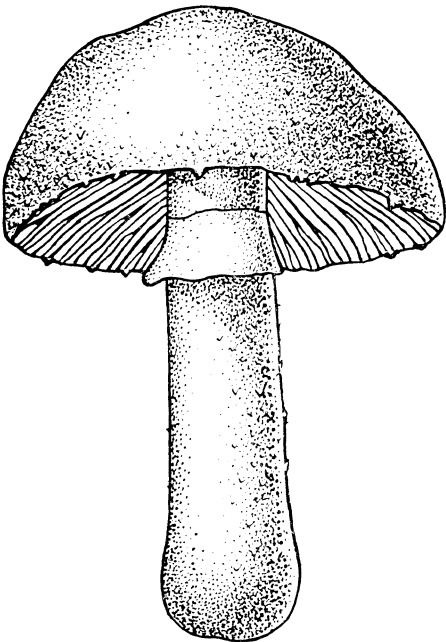


PLATE 4.



1



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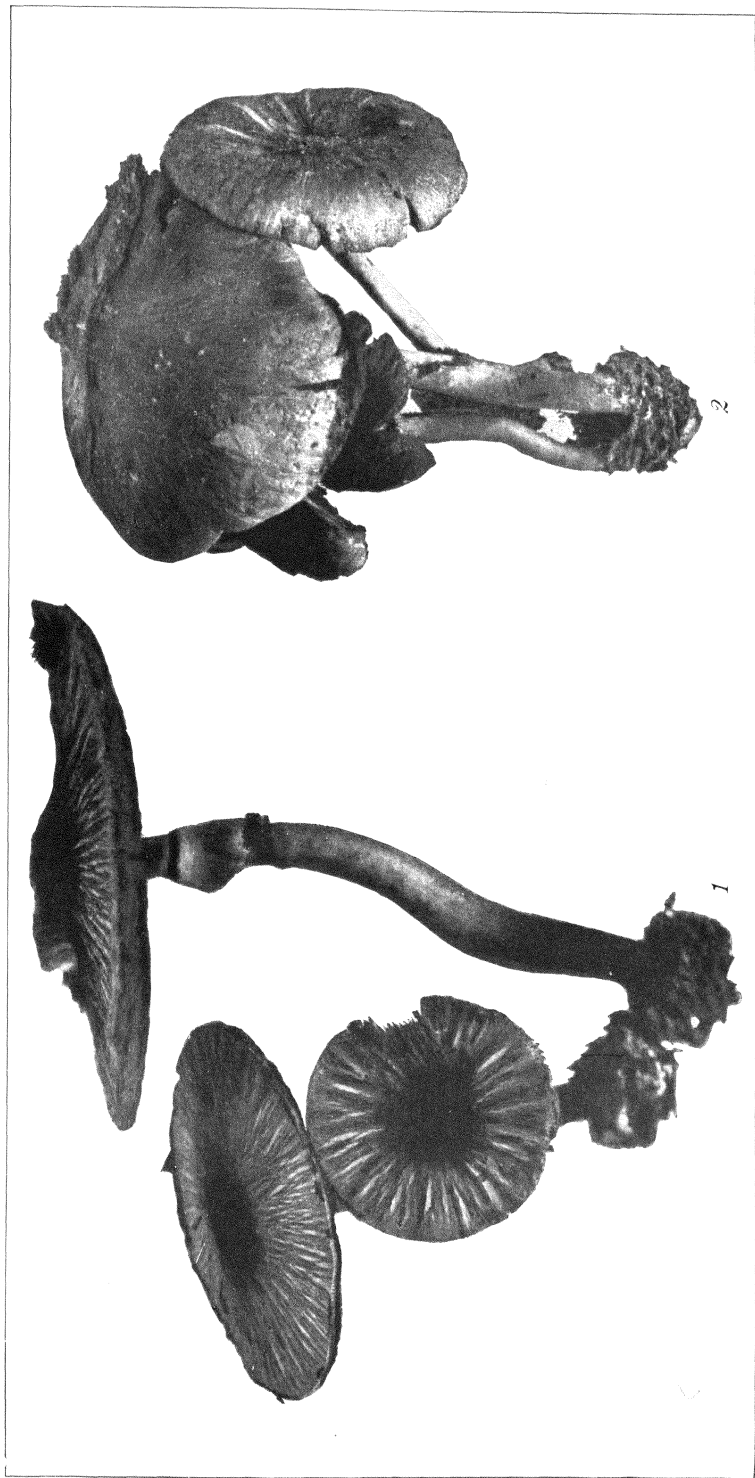


PLATE 6.

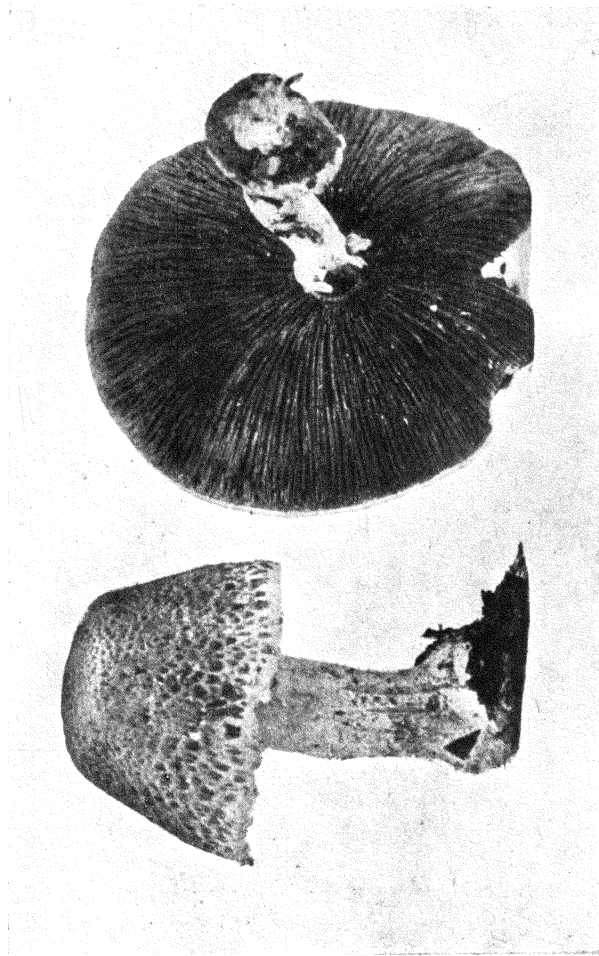


PLATE 7.



PLATE 8.

BOOKS

Books reviewed here have been selected from books received by the Philippine Journal of Science from time to time and acknowledged in this section.

REVIEWS

Dictionary of Scientific Terms as Used in the Various Sciences. By C. M. Beadnell. London, Watts & Co., 1938. 235 pp. Price, 1/-.

The need for a good English dictionary of scientific terms is only too apparent to the editor of a technical publication. In manuscripts sent to technical periodicals for publication, terms continually crop up that often not only are unfamiliar to the editor but are even unknown to many workers in the chosen field of the authors of these manuscripts. Standard dictionaries usually fail to give the necessary definitions of these terms, either because they do not contain them at all or because the usages given do not include the specialized ones required.

Unfortunately, the few attempts that have so far been made to meet this real need only tend to emphasize it. The present reviewer recalls with some sadness in this connection a German-English technical dictionary that does not include trade names of chemical compounds that have acquired general use in laboratories; a chemical dictionary is gathering dust on his shelf because it does not give abbreviations of chemical compounds. "A Dictionary of Scientific Terms" seemed to be the welcome answer to the needs of the present reviewer; it seemed so well arranged and seemed to cover such a wide range of technical matters that its perusal could not but inspire confidence; however, subjected to a practical test, it proved no less disappointing than, say, Webel's "Technical Dictionary, English and German," or Patterson's "German-English Dictionary for Chemists," for it failed to cover such common word as "enzootic," "zootic," "necrotic," or "alula."

Perhaps the most constant failing of dictionaries of this type is that they do not give complete terminologies of any particular field of science, but instead give a little of everything. Consulting them is still very much of a gamble, with the indifferent success of a housewife who rummages through her button box

in the hope of finding the right button to replace the one lost from her husband's shirt. Attempts made so far show the need, on the part of the compilers, of more intensive research in a properly limited field, rather than of extensive effort thinly spread over many fields of science.

Beadnell's book has the merit that it is moderately priced, of convenient size, small enough to be carried in a pocket or stuffed into a drawer, and that the definitions given are complete and thoroughly concise. But the technical dictionary editors and readers of technical publications are waiting for is yet to be written; perhaps it will at last come out of the pen of some editor who has spent several decades at the desk over the manuscripts of one of our leading scientific publications, and who has—a rare quality in editors—a mania for collecting, ordering, and filing pertinent data over a long period of years.—S. R.

The Forest Manager. A Handbook for Farm Woodland Owners and Others Who Manage Their Own Woodlands. By Dr. Karl Dannecker. American edition. Translated by Arthur O. Weidelich. Washington, D. C., The American forestry association, 1939. 172 pp., front., illus. Price, \$2.

The "Forest Manager," written in German, has been made available to the English speaking peoples by Arthur O. Weidelich. Although intended primarily for private woodland owners, this book is equally valuable as a guide to managers or administrators of state-owned forests.

The intensity of forest management for the production of industrially useful forest products, particularly wood, is anywhere in inverse ratio of the existing forests. Thus Germany, where the total forest area is but one-fourth of the total area of the country, and 47 per cent of this forest area is privately owned, is foremost in the science and art of forestry. The Philippine forests cover approximately three-fifths of the total land area of the country, and out of this forest land only about 2.5 per cent is privately owned. Due largely to this fact the Philippines is still in what may be called the preliminary stage of intensive forest management. This book is of great interest to us because of the authoritative information it imparts as to the position of forests in the national economy and the part they play in our daily life.

Written in a language that can be readily understood, this book will be a good addition to every school library in the Philippines for the development of understanding and appreciation

of the value of forests, which are prerequisites of the institution of rational forest husbandry.—F. T.

Textbook of Meat Inspection. By J. Drabble. 2d. rev. ed. Sydney and London, Angus & Robertson, Ltd., 1938. 383 pp., illus. Price, 25/-.

The *Textbook of Meat Inspection*, by Drabble, is especially prepared for lay meat inspectors. It is divided into two parts. The first part deals with elementary anatomy and physiology and serves as an introduction for a beginner to a complete idea of the subject. It is an indispensable guide to meat inspectors in correlating the value of a knowledge of anatomy and physiology to pathological conditions. It contains a summary and a list of questions, after each chapter, that call to mind important facts relating to the topic discussed.

The second part of the book contains an extensive discussion on meat inspection, describing the procedure followed in the examination of live animals (ante-mortem examination) until the meat has been certified suitable for food. In this part is discussed the differentiation of the meat of different animals. The common pathological conditions encountered in meat inspection are described. Bacterial and parasitic diseases are fully discussed in clear, simple, but comprehensive manner, so that even the beginner in meat inspection can easily understand the information. The discussion on the circulatory and lymphatic system serves to elucidate the complicated avenues of infection which lead to the generalization of disease.

The last portion deals with staining methods and their uses in the diagnosis of diseases most commonly encountered in post-mortem examination.—J. J. B.

A Nutrition Manual. By Henrietta C. Fleck. Ann. Arbor, Michigan, Edward Brothers, Inc., 1938. 180 pp.

The information this manual conveys is presented in a series of questions and suggestions, arranged in an outline form. An interesting feature of the book is that the different topics are not discussed as in other books, but are presented as groups of problems for study and verification. The author refers the reader to books and magazines where correct data and information in connection with the subject under study can be obtained. All the problems touched upon in this book deal exclusively with the common aspects of nutrition in relation to the daily life of man. Every problem is treated in the form of questions, a list of references, and assignments of tasks to be performed.

The important feature of this book is that it stimulates the reader to search for a broader knowledge of some of the important and common aspects of nutrition. Among the problems presented are those which deal with the metabolism of food in the human body and the sources, chemical composition, and dietary values of the different food elements, such as carbohydrates, fats, proteins, inorganic salts, and vitamins. It serves as a good guide in planning an adequate dietary that is economical and beneficial and possesses high nutritive value. It includes correct meal planning for infant and child feeding and hospital dietaries. It offers the school authorities a program of health education among school children.

All the problems presented in this book are of vital importance to persons and institutions who are actively engaged in nutrition studies.—P. J. A.

Mineral Valuations of the Future. By C. K. Leith. New York, American Institute of mining and metallurgical engineers, Inc., 1938. 116 pp., Price, \$1.50.

This book is intended more for the professional engineer than for the engineering student.

The author acknowledges that the basic principles involved in the physical valuation of mining property are still as important as ever, but he points out that there is a marked tendency among nations that are not self-sufficient in mineral wealth and can foresee the eventual exhaustion of their mineral deposits to pass laws which tend to affect the future values of their mining properties. Such factors as taxation, legislation, production and price control, labor organizations, tariff walls, changing trends of consumption on account of improvement in technic, and many other special measures designed to control national and international movements of minerals are discussed by him as indications of the present trend toward economic nationalism.

Professional engineers, therefore, would do well to read this book. The author admits that although these factors are intangible and immeasurable, they are nevertheless powerful enough to affect the future value of a mine, and the valuation engineer of the future should give them their proper weight if he is to give a true value of the mine.

Doctor Leith's discussion is backed by an enormous wealth of experience which he gathered in his capacity as technical consultant on minerals and geological matters of both national and

international importance. Any writing of Doctor Leith on these subjects is therefore at once authoritative and instructive.

—F. C. B.

Theory and Practice of Mine Ventilation. By William J. Montgomery. Columbus, Ohio, The Jeffrey manufacturing Co., 1936. 185 pp., illus. Price, \$3.50.

Of the many books written on mine ventilation, the majority are highly technical in nature and directed principally to the attention of those versed in higher mathematics. This volume ably fulfills its purpose in giving a comprehensive idea of the fundamental principles involved in efficient mine ventilation to both the graduate mining engineer who has been unable to keep abreast of the subject and the practical mining man desirous of a more thorough knowledge and understanding of these fundamentals. Every angle of this vitally important subject is explained in a manner and language easily understandable. Although the book is written primarily for coal mining, those interested in metal mining would profit much by making a conscientious study of it.—G. H. M.

Nomenclature Zoologicus. In Four Volumes. Vol I, A-C. Edited by Sheffield Airey Neave. London. The Zoological Society of London, 1939. xiv, 385, 480 pp. Price, postpaid, 8 guineas.

As stated in the editor's preface, "This work constitutes an attempt to give as complete a record as possible of the bibliographical origins of the name of every genus or subgenus in zoölogy that has been published since 1758, the date of the 10th Edition of Linnæus' '*Systema Naturae*,' up to the end of the year 1935." It is distinctly a labor of love. It was prepared in order to lighten the burden of systematists by providing them with a reliable and up-to-date index on generic names.—M. T.

Petroleum Development and Technology, 1939. Transactions of the American institute of mining and metallurgical engineers, 132. The American institute of mining and metallurgical engineers, New York, 1939. 625 pp., illus., tables, diags. Price, \$5.

The "Petroleum and Technology 1939" published by AIME, is a complete symposium of papers and discussions presented before the Petroleum Division at San Antonio, October 5 to 7, 1938; Los Angeles, October 20 and 21, 1938; and New York, February 13 to 16, 1939. It treats primarily of drilling and production problems based upon the experience of various technical men in the oil industry throughout the world.

In this symposium papers relating to allied subjects are grouped together into chapters. Chapter I treats of engineering, describing methods used in solving production and drilling problems in individual areas. A complete description of the mud technique in Iran is given by the Resident Geologist, M. W. Strong, who touches on the chemistry of drilling muds as well as on the physical properties of the various subsurface formations and their effects on mud control. Core analysis is described by Howard C. Pyle and John E. Sherborne with special reference to permeability or fluid-passing capacity of a rock. The work was confined to core samples in calculating the fluid content. Bottom hole measurements in pumping wells are described by J. J. Jakosky, who describes the reflecting method by timing an impulse from the surface to the fluid level and return. Exploring drill holes by sample-taking bullets is described by T. Leonardon and D. C. McCann, who give the percentages of core recovery by their method and the use of the core samples when taken. There are also two abstracts given; one on acid treatment of limestones by R. E. Heithecker, and decline curve analysis by H. E. Gross. There are also two core analysis papers given, one by H. G. Botset on a method for determining the water content of sand, and another by A. B. Stevens, who describes a porosimeter for the determination of porosity by the gas expansion method.

Chapter II is devoted to engineering research. All of the papers describe the various problems in individual fields and the engineering methods used in solving them. The arrangement of the laboratory apparatus with figures describing it and the method of solving the production problems are shown. Tables, graphs, and mathematical formulas show the basis for the final conclusions.

Chapter III deals with petroleum economics. The papers deal with effective proration, economic equilibrium of refining operations, and the world consumption of petroleum and related fuels.

Chapter IV deals with production. It is divided into two parts, domestic and foreign. The domestic part gives production data in every state in which petroleum is produced. Tables showing the gravity of the oil, the average depth of individual fields, and the total production for the year enhance the usefulness of the book. In some cases a complete description of new fields is given. The second part of the chapter is devoted to foreign fields. It gives a resumé of new fields and geological

and production data of past producing fields. At the end of this chapter is an estimate of world reserves given by V. R. Garfius and R. V. Whetsil.

Chapter V gives a review of Refining Engineering for 1939 by Walter Miller. It describes the new equipment and new refining processes.

An index completes the book.—G. W. C.

Major Endocrine Disorders. By S. Levy Simpson. London, John Bale medical publications, Ltd., 1938. 184 pp., illus. Price, 10/6d.

This book is a profusely illustrated compendium of endocrine disorders. The author has successfully presented in 184 pages the points most useful for the recognition, understanding, and treatment of the results of the diseases of the endocrine bodies in the light of their known or generally accepted functions. He has avoided lengthy discussions on controversial topics, but his succinct and clear presentation of opposing views as well as of his own is satisfying.

For the student of the normal and abnormal functions of the endocrine bodies, this book furnishes an up-to-date summary of the present knowledge of the physiology of these glands.—E. B.

The Wheel of Health. By G. T. Wrench. London, The C. W. Daniel company, Ltd., 1938. 146 pp., front. Price, 6/-.

Doctor Wrench approaches the study of health by the study of a very healthy people. The Hunza people of India have achieved a reputation for their strength, agility, longevity, and endurance unsurpassed by the people of any modern nation. A study of their environment, method of living, and diet shows no radical difference in these factors of health from those enjoyed by neighboring peoples; yet, a comparison of the physical and mental qualities of the Hunza with those of his neighbors proves the Hunza superior. By minute inspection and close study of the Hunza people Doctor Wrench has discovered that, in common with other healthy peoples, "the Hunza have attained environmental wholeness of which a whole diet is the vital factor, and that a whole diet means not only the right sort of foods but their right cultivation as well." In his inimitable manner, Doctor Wrench proves that food and its right cultivation are responsible for the excellent physical and mental well-being of the Hunza.

By checking his findings against the results of the experiments of Sir Robert McCarrison, McCollum and Simmonds, Sir Albert Howard, the experiments of the Dutch during the World War,

and the findings of agriculturists and others, Doctor Wrench proves that health is attainable by right diet and the proper cultivation of foods; that is, by respecting the Wheel of Health which is essentially from man to soil, from soil to plant, from plant to man.—H. L.

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NOTES ON FISHES IN THE ZOÖLOGICAL MUSEUM OF STANFORD UNIVERSITY, VII

NEW AND RARE PHILIPPINE GOBIES FROM THE HERRE 1936-1937
ORIENTAL EXPEDITION, AND IN THE COLLECTIONS
OF THE BUREAU OF SCIENCE

By ALBERT W. C. T. HERRE
Of Stanford University, California

SIX PLATES

I was able to spend most of December, 1936, and half of January, 1937, in the Philippines. At Nasugbu, Batangas Province, facing the China Sea, a number of surprising novelties were obtained during this trip, as well as several little-known species of fishes. At Dumaguete, Oriental Negros Province, as usual, more new fishes were collected, and from various parts of the Islands other new or rare species were secured. A marked feature was the high proportion of imperfectly known or new gobies obtained. In addition, the unnamed gobies in the collection of the Division of Fisheries of the Department of Agriculture and Commerce were studied, and revealed very interesting or unknown species. Five species believed to be new are here presented, together with annotations upon several others notable for their apparent rarity.

Nasugbu faces the open China Sea, and the collections obtained there within a few hours show that similar intensive collecting almost anywhere along the Philippine coast of the China Sea would richly repay students of fishes. The coasts of Zambales, Pangasinan, and the Ilokos Provinces, and Mindoro, Palawan, and Balabac Provinces all offer great possibilities.

Careful exploration of their shores will add greatly to the fish fauna of the Philippines.

The drawings are the work of the outstanding Philippine fish artist, Mr. Pablo Bravo.

GOBIUS ELMERI sp. nov. Plate 1.

Dorsals VI, I, 8; anal I, 7; scales in longitudinal series 36 plus 2 on caudal base; in transverse series 11; predorsal scales 4, very small.

Body slender, with nearly parallel dorsal and ventral profiles, depth 6 times in length. Head broader than deep, length 3.3 in standard length; rounded caudal equaling head.

Dorsolateral eyes very close together, 3.4 times in head, inter-orbital space a mere line, about 20 times in eye diameter; blunt, short snout 4.25 in head; mouth nearly horizontal, maxillary reaching a vertical from front margin of pupil, 2.8 in head; upper jaw with an outer row of enlarged teeth, 3 rows of very small teeth behind; lower jaw with a similar arrangement, outer teeth only half the size of outer row above.

Low first dorsal scarcely reaching second dorsal origin when depressed, 12.8 in head; second dorsal and anal not reaching caudal base when depressed, fins equal, highest posteriorly, 2.25 times in head; broadly rounded pectoral equal to head; upper rays characteristic of genus, free and silky; broad ventrals reaching anus, 4.3 times in length, 1.3 in head; least depth of caudal peduncle 1.8 times in own length.

In alcohol dark brown, with traces of 4 crossbands over back, first predorsal, second under first dorsal, the other two under second dorsal; along side, from pectoral axil to caudal, a row of 8 nearly circular black spots; first dorsal with a dark-brown crossband; second dorsal, anal, and caudal dark brown; pectoral and ventral light brown, pectoral with a large blackish bar on base.

Described from the type and only specimen, 28 mm long, taken from a tide pool at Nasugbu, Batangas Province, Luzon.

I take pleasure in naming this species after my fellow student and friend of many years standing, Mr. A. D. E. Elmer, distinguished for his work in Philippine botany.

VAIMOSA CARDONENSIS sp. nov. Plate 2.

Dorsals VI, I, 7; anal I, 6 or 7; scales in lateral series, 24 plus 1 or 2, rarely 23 plus 2; scales in transverse series, 9; predorsals 9 in males, usually only 7 in females; two anterior scales enlarged, last scale partly between hind portion of eyes.

In mature males depth 3.8 to 4.2, head 2.8 to 3.1, caudal 3.8 to 4 times in length; eye 3.75 to 4, snout 4.8 to 6, height of first dorsal 2.4 to 2.5 times in head; second dorsal and anal of same height, 2 to 2.1 in head, pectoral 1.2 to 1.4, ventral 1.5 times in head. Mouth very large, maxillary in old males reaching angle of preopercle, then 1.2 times in head; least depth of caudal peduncle 1.8 in head, 1.3 times in its own length.

In gravid females depth 3.4 to 3.8, head 3.2 to 3.6, caudal 3.4 to 4 times in length; eye 3.33 to 3.6, snout 5 to 5.5, first dorsal height 2.5 times in head; second dorsal and anal usually of same height, rarely anal a little higher, 1.66 to 2 times in head; pectoral 1 to 1.25, ventral 1.25 times in head; mouth small, maxillary sometimes extending to a vertical from middle of eye, 3.1 to 3.33 times in head.

Body relatively stout and deep, arched back curving to boldly convex snout; eyes flush with profile or projecting above it, very close together, interorbital very narrow, usually but a line; in males head large, thick and heavy, wider than deep, breadth equal to distance from middle of eye to posterior end of head. Vertical fins low, first dorsal rarely reaching origin of second dorsal when depressed; the somewhat pointed pectoral elongate; the small ventrals not reaching anus in females, sometimes reaching anus in males.

In alcohol pale yellow, scales of upper half more or less tinged with pale brown or with pale-brown margins; some specimens show traces of 4 or 5 dorsal crossbands and 4 spots along middle of side; upper part of eye heavily pigmented, blue-black; first dorsal with a brown band basally, usually poorly defined; second dorsal with 2 or 3 brown crossbands; caudal with 3 irregular brown crossbands; anal dusky, ventral clear to dusky; pectorals clear.

The type is a male, 21 mm long. Described from 35 specimens, 14 to 21 mm long. Ten of the specimens are males and the rest are females, nearly all in breeding condition. Females 15 mm long are full of eggs. The specimens came from Cardona, a town on the north coast of Laguna de Bay, Luzon. The collector failed to state whether they were taken from a stream or from the lake itself, but they probably came from the latter.

VAIMOSA FUSCA Herre sp. nov. Plate 3.

Dorsals VI, I, 7; anal I, 7; 30 scales in a lateral series, first two much smaller than the rest, plus 3 on caudal base; 10 scales

from second dorsal origin to anal origin, and 10 predorsal, anterior scale very large, extending to interorbital; 16 scales on opercle.

Depth 4.25, broad, rounded caudal 3.75, head 3 times in length; eyes large, close together, dorsal, in anterior half of head, extending above dorsal profile, 3.33 times in head. The bluntly rounded, very short snout two-thirds of eye, 5 times in head; postorbital longer than eye and snout together, 1.9 in head; interorbital 1.75 times in eye.

Dorsal profile horizontal, ventral profile arched from chin to caudal base, posterior half of body strongly compressed, head broader than trunk, its width equal to greatest depth or 1.4 times in length of head. Mouth oblique, small, jaws equal, maxillary extending to a vertical from anterior part of eye in type, somewhat larger in paratypes. Teeth minute, in 3 rows in both jaws. A row of sensory papillæ beginning before middle of eye and running down to and across middle of preopercle; between it and eye a second, much shorter row.

Dorsals close together, first dorsal damaged but its height 8 times in length, 2.625 in head; in male specimens second spine greatly elongate, 2.5 times in length; last second dorsal ray longest, falling far short of caudal when depressed, 6.4 times in length, 2.1 in head; last anal ray longest, not reaching caudal, 5.33 times in length, 1.75 in head; pectoral pointed, 3.76 times in length, 1.24 in head; broad ventral 4.57 times in length, not reaching anus by 2 scales; least depth of caudal peduncle 1.6 times in own length, 2.1 in head.

In life blackish brown, a few black crossbands on posterior part dimly visible posteriorly, masked by general dark color. Two conspicuous circular black spots on caudal base; first dorsal with 2 basal black spots and a median brown crossbar, expanding into a large black spot between third and last spines; second dorsal dusky, with blackish-brown spots on membranes; anal very dark, with 2 blackish-brown spots beneath it and a cross-row of large blackish-brown spots along middle; light-brown caudal crossbarred by rows of blackish-brown spots on rays; pectorals clear, ventral dusky. In alcohol little different, dark brown all over, top of head blackish, each scale with a blackish-brown basal spot.

The type is a female, 32 mm long, not in breeding condition, taken from a tide pool at Dumaguete, Oriental Negros Province, in December, 1936. The anal papilla is thick, rounded at the tip, and rather short.

Fusca, dusky.

A male paratype, 24 mm long, taken from a mangrove swamp on Singapore Island, presents several differences, but undoubtedly belongs here. Dorsals VI, I, 7; anal I, 6; scales 28 in lateral series, plus 2 on caudal base, 9 in transverse series; predorsal scales 10, opercular scales 16. Depth 4.3, head 3.6, caudal 4 times in length. Eye 3.5, snout 4.46 times in head; interorbital a little broader than eye.

In the male the color pattern in alcohol is not marked by dusky brown, as in the female. A series of 5 blackish-brown crossbands over the back merges with a series of dusky elongate spots along the side, forming a series of stripes running diagonally downward and forward; all the scales are more or less brown, except on the throat and abdomen; two circular black spots on the base of the caudal, as in the type, the upper one the larger; the first dorsal is black on the basal half, with a broad white bar above, and a black margin; the second dorsal has 2 crossbands of black spots; the caudal has many crossrows of fine black dots; the anal is dusky with a white margin, the other fins clear.

Fifteen paratypes from Dumaguete range from 12.5 to 29 mm in length, and agree in the main with the Singapore specimen; preopercular scales 14 to 16; in lateral series 26 to 30; predorsal, 10 to 12. The maxillary does not exceed a vertical from the rear edge of the pupil. Depth 3.5 to 4 in length. Their color varies from very pale to very dark brown. All have the 2 conspicuous circular spots on the caudal base and all have 5 to 7 black stripes over the back and down the side to or nearly to the abdomen, giving it more or less of a brindled appearance and making it very conspicuous when mixed with other *Vaimosa* species. The first stripe is over the nape and descends diagonally behind the pectoral base; the second runs down from the large black spot on the first dorsal and is inclined forward; two descend from the second dorsal and two are on the caudal peduncle; sometimes one is missing or an extra one is interpolated; they may be vertical, inclined forward, or angulate with the angle forward.

BRACHYGOBIUS AGGREGATUS sp. nov. Plate 4.

Dorsals VI, I, 6; anal I, 6; scales in lateral series 22 or 21 (rarely 23), plus 1, 2, or even 3 on caudal base; transverse series 7 or 8; no predorsal scales.

Thick, robust, back slightly convex, head large, bluntly rounded, short snout nearly vertical.

Females have the depth 2.8 to 3, head and caudal 2.7 to 3 times in length; head much wider than deep, length equal or nearly equal to body depth, breadth 1.1 to 1.2 in length; eye in first half of head flush with profile or slightly projecting, 3.5 to 3.7, snout 4.5 to 4.8, postorbital twice in head; interorbital equaling eye. Mouth very oblique, with projecting, heavy lower jaw, maxillary equal to eye and reaching beneath front part of eye. Teeth typical of the genus. The head, nape, breast, and pectoral base naked, or opercle sometimes with one or two scales near upper margin.

First dorsal low, not reaching second dorsal when depressed, 3 to 3.3 in head; second dorsal and anal also low, far short of caudal when depressed, second dorsal 1.9 to 2.4, anal 2.25 to 2.4, pectoral and ventral 1.5 to 1.8 times in head; least depth of caudal peduncle 1.66 to 1.75 times in length; ventral reaching anus or broad, thick, anal papilla.

The male type has the depth 3.3, caudal 2.9, head 2.7 times in length; eye 3.25, snout 1.85, postorbital 1.9 times in head; vertical fins all low, first dorsal 2.8, second dorsal 2.5, anal 2.8 times in head; pectoral 1.4, ventral 1.7 times in head; least depth of caudal peduncle 1.66 times in own length.

In life butter-yellow, with 4 broad black bands over back; first band extending from nape to anterior part of first dorsal, anterior portion extending down upon opercle, rear portion running down beneath pectoral to meet its fellow on abdomen; in young specimens there are two bands which unite to form the wide band just described; second band extending from insertion of first dorsal to middle of second dorsal base, with a belt extending below second dorsal to middle of anal base; third band behind vertical fins, fourth on caudal base, third and fourth on under side of caudal peduncle; snout and interorbital dusky, sides and under part of head sprinkled with black dots; pectoral with a black spot on base; other fins all clear, except where crossbands touch dorsals. In alcohol the yellow fades to whitish, markings unchanged.

Described from two female types, 13.5 and 14 mm long, and a male type, 11.5 mm long, from Dumaguete, Oriental Negros Province. One hundred paratypes, 11 to 44 mm long, were also taken at the same time. With these were 14 young, ranging down to 6.5 mm in length.

From Kabili River, British North Borneo, were collected 67 paratypes, 9 to 15 mm long.

All Dumaguete specimens, collected December 26, 1936, 11.5 mm long, were in breeding condition. Males begin to breed at that length, but never attain the size, neither in length nor in thickness, of females. The latter start breeding at a length of 12 mm and become very bulky, with protuberant abdomen. Few of the Kabili River specimens, collected February 5 and 6, 1937, were in breeding condition.

Unlike most gobies, this little fish congregates in schools containing up to 100 or 150 or more individuals. These fish like to congregate in shaded eddies and backwaters of small streams, protected by logs or roots. Nearly all the Dumaguete specimens were taken from such localities; a few were taken from small brackish-water pools in an adjoining nipa swamp. After one makes a dash with a dip net into a school, the remaining individuals disperse and dive to the bottom to hide.

The Kabili River specimens were taken from tiny pools in a mangrove swamp which was brackish part of the time.

Swarms of them were seen in very shallow water filled with mangrove roots which prevented their capture.

Aggregatus, crowded together, in allusion to their habit of forming schools.

MACGREGORELLA BRAVOI sp. nov. Plate 5.

Dorsals VI, I, 9; anal I, 8; scales in longitudinal series 35, plus 1 or 2 on caudal base; transverse series 18; predorsals 6 to 10.

Depth 5.4 to 5.6, head 3, caudal 3.3 to 3.5, pectoral 3.75 to 4 times in length. Width of head 1.3 times, depth twice in own length. Eyes small, laterodorsal, 7 times, snout 4 times in head.

Dorsal and ventral profiles nearly horizontal and parallel, breadth of trunk 1.9 times in width of head. Mouth wide, short, oblique, not extending more than half way to a vertical from eye; teeth very small, in 4 rows, those of outer row in lower jaw enlarged and curved backward. Vertical fins all low; first dorsal reaching second dorsal origin when depressed, 2.8 to 3.3 in head; second dorsal and anal scarcely reaching broadly rounded caudal when depressed, 2.3 to 2.5 times in head; pectoral about 1.25 times in head; short broad ventrals completely united as in all members of the genus, 1.8 times in head. Least depth of caudal peduncle 1.3 times in own length in type.

On margin of snout a row of short, erect, fringed barbels, a second row before eyes; a row of 6 short barbels running back

on each side from chin; another row of small barbels running back from angle of mouth; behind eyes a crossrow of 5 sensory papillæ; on cheek 3 longitudinal rows of papillæ and 3 short vertical rows on opercle; another row passing along outside of eye and running back to nape, which may have several other very short rows.

In alcohol very pale tan, with 5 brown crossbars; first crossbar on top of head, second over pectoral base, third under first dorsal, fourth and fifth under second dorsal; a broad brown band extending from upper angle of pectoral to caudal base; a large brown bar or blotch across pectoral base; a brown bar or rows of brown spots on first dorsal; second dorsal and caudal crossbarred by rows of brown spots; caudal base also with a large dark-brown spot above and below; other fins colorless.

Described from the type, 30 mm long, and 4 paratypes, 24 to 28 mm long, from Nasugbu, Batangas Province, Luzon. Another paratype, 32 mm long, was taken by me at Waigiu, in the Dutch East Indies; another specimen from Waigiu is 14 mm long.

This very distinct species is merely an extreme type of *Macgregorella*, having few or no ridges on the head, but instead, short barbels and papillæ. However, its general appearance denotes close relationship to the other species of *Macgregorella*. The typical goby ventrals separate it from *Callogobius*, which it otherwise resembles in various respects.

I take pleasure in naming this species for Mr. Pablo Bravo, my artist for many years.

ELEOTRIDÆ

BORODA ALBO-OCULATA Herre.

Boroda albo-oculata HERRE, Gobies of the Philippines (1927) 58.

Two specimens from Nasugbu, 23 and 88 mm long. Hitherto known only from a series taken at Taytay, Palawan.

HERREOLUS FORMOSUS H. M. Smith. Plate 6.

Herrea formosa H. M. SMITH, Proc. U. Nat. Mus. 79 (1931) 40.

Seven specimens, 12 to 15 mm long, were taken from a tide pool at Dumaguete, Oriental Negros Province. Dorsals VI, I, 12 or 13; anal I, 12 or 13; ventral I, 3. Four specimens, 13 to 31 mm long, were captured with a dip net at Port Holland, Ba-

silan. A school of these fish lived in the growth on the piling of the wharf, whence they would emerge and swim about freely on the surface of the water, which is deep enough for ships to lie alongside the dock. At the slightest alarm they would dart back into the protection of the growth on the piling, so that it was very difficult to get at them. The Port Holland specimens had dorsals VI, I, 13 to 16; anal I, 12 to 15. However, there can be no question of their identity with those from Dumaguete.

Doctor Smith had only one specimen, 23 mm long, from an island in the Gulf of Siam. My specimens agree with his in every respect except that his has 5 spines in the first dorsal and some of the Port Holland specimens have a larger number of dorsal and anal rays.

A narrow black stripe extends along the middle of the back from the tip of the snout to the caudal base; a broad black stripe runs from the lower jaw across the lower half of the eye and along the side to the tip of the caudal fin.

The name *Herrea* was preoccupied.

VALENCIENNEA VIOLIFERA Jordan and Seale.

Valenciennea violifera JORDAN AND SEALE, Bull. Bur. Fish. 25 (1906) 383, pl. 52, fig. 2.

Two typical specimens, 38 and 45 mm long, were taken at Nasugbu, Batangas Province. This handsome species was described from Samoa, where it is common. It was also collected at Bais, Oriental Negros, by the late Dr. Bashford Dean, in 1900-1901, but has not been obtained in the Philippines since.

GOBIIDÆ

BATHYGOBIUS NOX (Bleeker).

Gobius nox BLEEKER, Nat. Tijds. Ned. Ind. 1 (1851) 248.

Bathygobius nox HERRE, Gobies of the Philippines (1927) 116.

Three specimens from Nasugbu, Batangas Province, and 5 from Dumaguete, Oriental Negros Province, 22 to 41 mm long. New to the Philippines. This very rare species has been known from a few specimens described by Bleeker from the East Indies, and one specimen taken at Hongkong. It may be recognized by its uniform black or dark-brown color.

CRISTATOGOBIOUS LOPHIUS Herre.

Cristatogobius lophius HERRE, Gobies of the Philippines (1927) 170, pl. 13, fig. 1.

Ten specimens, 17 to 29 mm long, were taken at Nasugbu, Batangas Province. In males the third dorsal spine is elongate,

reaching to the middle of the base of the second dorsal. The second dorsal and anal fins extend upon the caudal fin when depressed.

In life males have a blue spot on each scale on the posterior half of the body, and 3 or 4 rows of blue ocelli on the membrane of the second dorsal and on the upper half of the caudal. The ocelli turn white in preserved specimens. Previously known only from 2 specimens from Bungau, Sulu Province, and 1 from San Jose, Antique Province.

CTENOGOBIOUS SULUENSIS (Herre).

Rhinogobius suluensis HERRE, Gobies of the Philippines (1927) 193, pl. 14, fig. 3.

Three specimens, 40 mm long, from Loay, Bohol. Hitherto reported from Bungau, Sulu Province, and Hathorn Sound, New Georgia Island, Solomon Islands.

GNATHOLEPIS DAVAOENSIS Seale.

Gnatholepis davaoensis SEALE, Philip. Journ. Sci. § A 4 (1909) 537.

Seale's type, from Samal Island, Gulf of Davao, was destroyed long ago. The species since then has been known from 19 specimens collected at Dumaguete, Oriental Negros Province, and 3 from Sitankai, 17 to 35 mm long.

At Nasugbu I secured 25 specimens, 18 to 32 mm long. Each scale on the upper third of the body has a circular black dot. The anal has 1 or 2 rows of black ocelli, the young 1, the adults 2 rows, one basal and one median. These ocelli alternate with large yellow spots, which become white in preserved specimens. The caudal has 5 to 8 rows of ocelli; those of the basal row are large and in a straight row; the others are in curved or angulate rows and much smaller, the posterior ocelli progressively smaller.

GNATHOLEPIS DELTOIDES (Seale).

Gobius deltoides SEALE, Occ. Papers Bishop Mus. 1 (1901) 125.

Gnatholepis deltoides HERRE, Gobies of the Philippines (1927) 133.

Nine typical specimens, 19 to 47 mm long, from Sitankai.

This wide-spread Polynesian goby has been known in the Philippines from a single specimen taken at San Juan, Siquijor.

GNATHOLEPIS GEMMEUS Herre.

Gnatholepis gemmeus HERRE, Gobies of the Philippines (1927) 135, pl. 9, fig. 3.

Fifty-two specimens, from 18 to 42 mm long, were taken at Dumaguete, Oriental Negros Province, and 78, from 12 to 34 mm long, at Sitankai.

In life this handsome little fish has brilliant emerald spots and dots all over the sides, with clusters of gold spots along the middle of the sides of the head and body. The anal has 2 rows of violet ocelli, alternating with vertically elongate yellow spots. The caudal is crossbarred with 5 or 6 rows of violet ocelli.

In alcohol the golden spots fade to pearl or bluish, with a black margin, the ocelli on the anal and caudal usually become black or dark brown, and most or all spots on the caudal disappear, except the basal row. The yellow spots on the anal turn white.

HERREA PRODUCTA (Herre).

Galera producta HERRE, Gobies of the Philippines (1927) 104, pl. 7, fig. 3.

Herrea producta (HERRE), Philip. Journ. Sci. 59 (1936) 368.

The name *Galera* was preoccupied; it was changed to *Herrea* by Whitley.¹

Two young specimens, 25 and 27 mm long, were collected at Dumaguete, Oriental Negros Province.

Dorsals VI, I, 11 or 12; anal I, 9 or 10; about 100 scales in longitudinal series. In adults there are from 70 to 90 scales, the posterior scales becoming larger and fewer with age. The predorsal region is scaled nearly to the eyes; the opercles are scaled and the preopercles are at least partially scaled above. The original description erred in saying the head and body before the first dorsal are naked.

MARS CÆRULEO-MACULATUS Herre.

Mars cæruleo-maculatus HERRE, Copeia (1933) 22.

Three specimens, 22 to 36 mm long, were collected at Dumaguete, Oriental Negros Province; previously known only from Jolo. Dorsals VI, I, 9 or 10. Scales in longitudinal series 60 to 65.

MACGREGORELLA INTONSA Herre.

Macgregorella intonsa HERRE, Gobies of Philippines (1927) 100, pl. 7, fig. 2; Fishes Herre Philip. Exp. 1931 (1934) 81.

Twenty-one specimens from Nasugbu, Batangas Province, and 26 from Dumaguete, Oriental Negros Province, 12 to 48 mm long.

MACGREGORELLA MOROANA Seale.

Macgregorella moroana SEALE, Philip. Journ. Sci. § A 4 (1909) 533; HERRE, Gobies of Philippines (1927) 102, pl. 28, fig. 1; Fishes Herre, Philip. Exp. 1931 (1934) 81.

¹ Austral. Zoologist 6 (1930) 123.

Twelve specimens, 26 to 60 mm long, were taken on the reef at Sitankai. Previously known from the type, 38 mm long, taken at Jolo, one specimen from Dumaguete, Oriental Negros, and one at Sitankai.

STIGMATOGOBIOUS TAMBUJON (Bleeker).

Gobius tambujon BLEEKER, Nat. Tijd. Ned. Ind. 7 (1854) 319.

A specimen, 24 mm long, from Dumaguete, Oriental Negros Province, was determined as this species by Dr. F. P. Koumans, the Dutch specialist on gobies. Previously recorded only from Java and Bali; new to the Philippines.

Dorsals VI, I, 7; anal I, 6; 25 scales in a longitudinal series, plus 2 on caudal base. Maxillary reaching beneath posterior part of eye.

VAIMOSA BIKOLANA Herre.

Vaimosa bikolana HERRE, Gobies of Philippines (1927) 151, pl. 11, fig. 2.

This species, described from 6 specimens 23 to 26 mm long, taken at Barrio Puru, Legaspi, Albay Province, proves to be abundant in Bohol and occurs also in North Borneo. The Bureau of Science collection contained a couple of hundred from 12 to 34 mm long, from Comon River, and many from 18 to 32 mm long, from Haya River, Bilar, Bohol. Nine specimens were taken from a brook at Tawau, and 3 from Kabili River near Tawau, British North Borneo.

ILLUSTRATIONS

[Drawings made by Pablo Bravo.]

- PLATE 1. *Gobius elmeri* sp. nov.; \times 7.
PLATE 2. *Vaimosa cardonensis* sp. nov.; \times 7.
PLATE 3. *Vaimosa fusca* sp. nov.; \times 5.
PLATE 4. *Brachygobius aggregatus* sp. nov.; \times 8.
PLATE 5. *Macgregorella bravoii* sp. nov.; \times 6.
PLATE 6. *Herreolus formosus* Smith.

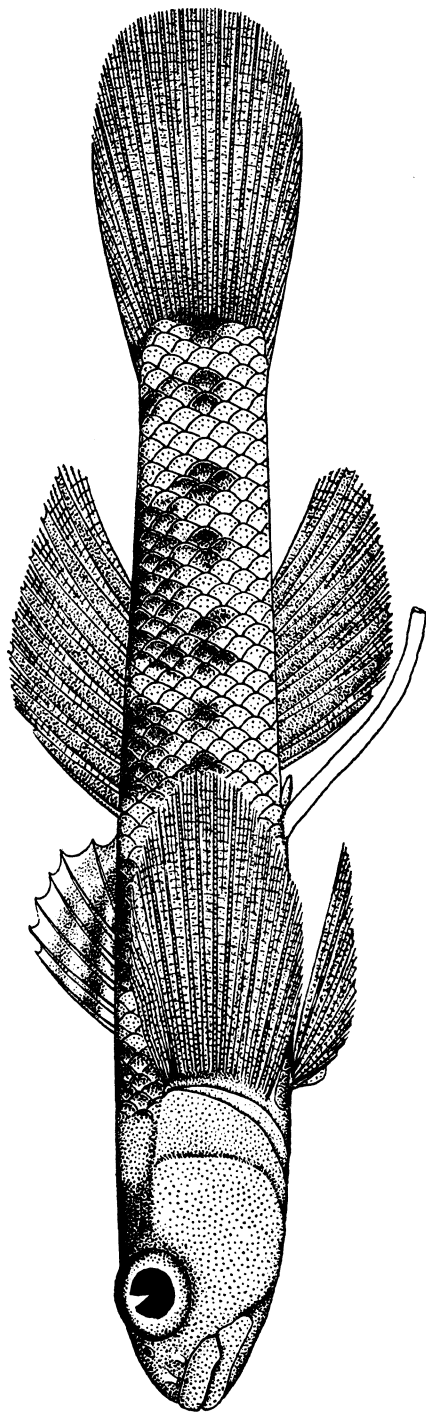


PLATE 1. GOBIUS ELMERI SP. NOV.

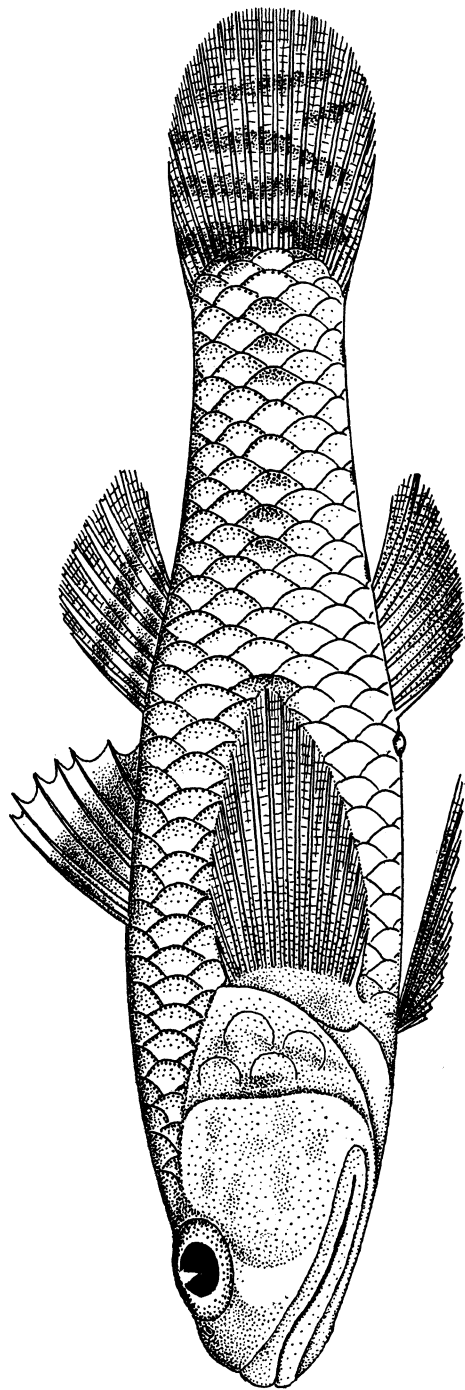


PLATE 2. *VAIMOSA CARDONENSIS* SP. NOV.

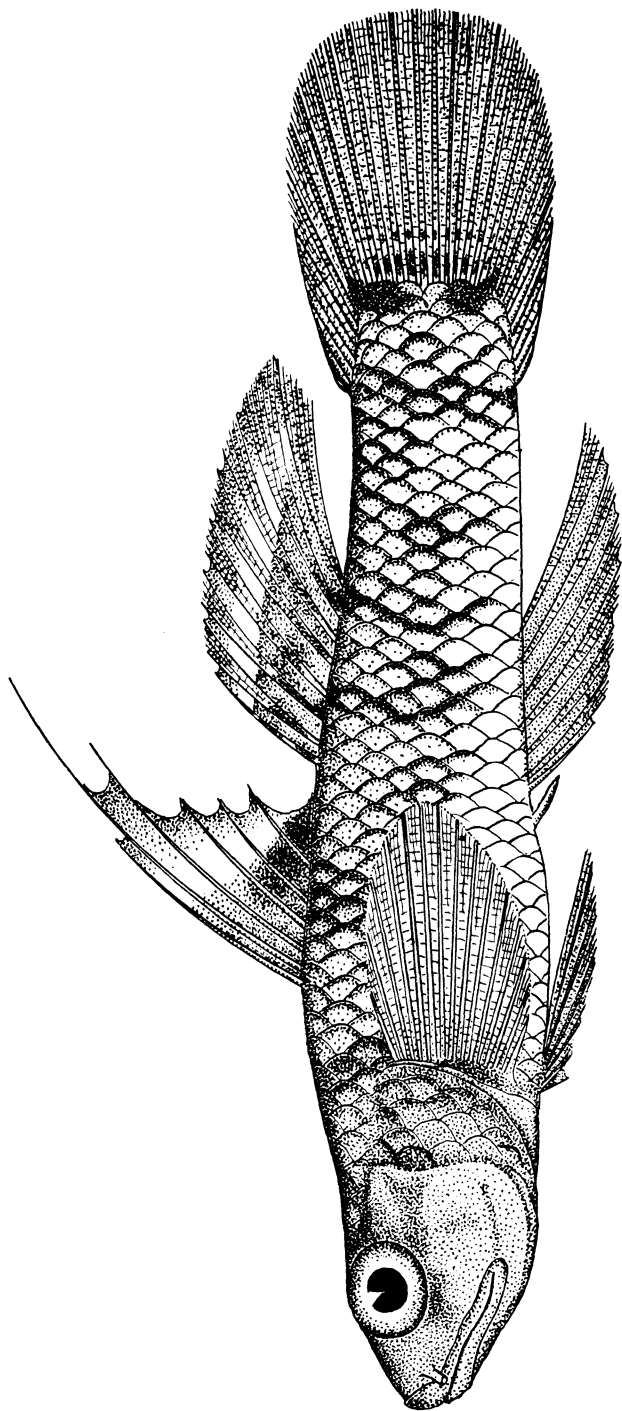


PLATE 3. VAIMOSA FUSCA SP. NOV.

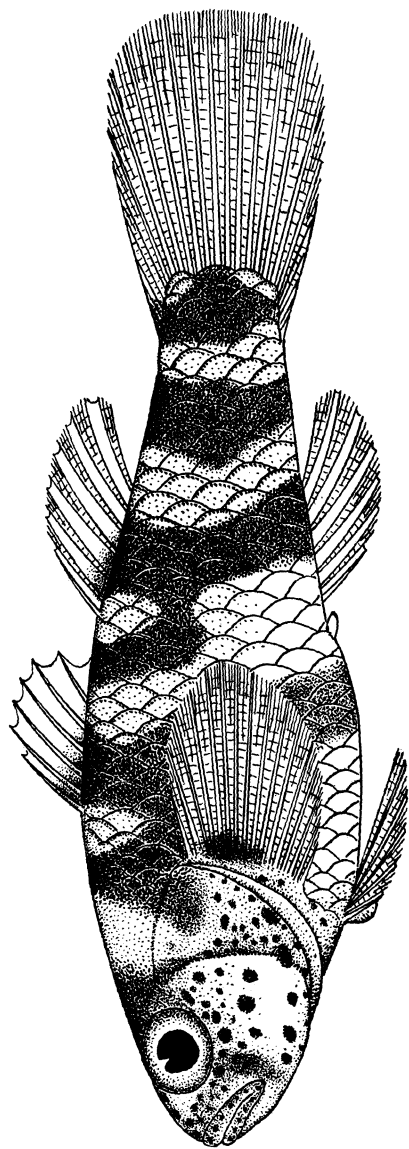


PLATE 4. BRACHYGOBIUS AGGREGATUS SP. NOV.

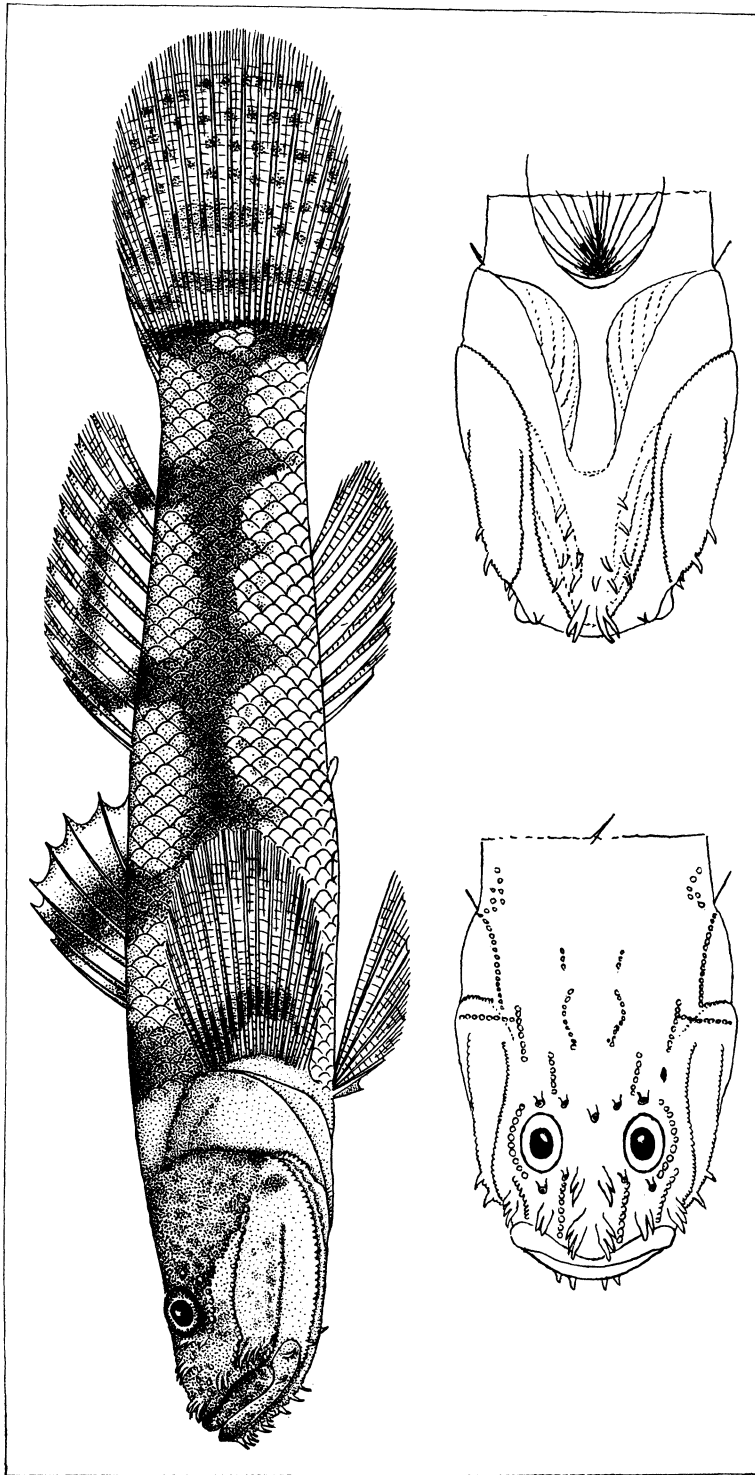


PLATE 5. MACGREGORELLA BRAVOII SP. NOV.

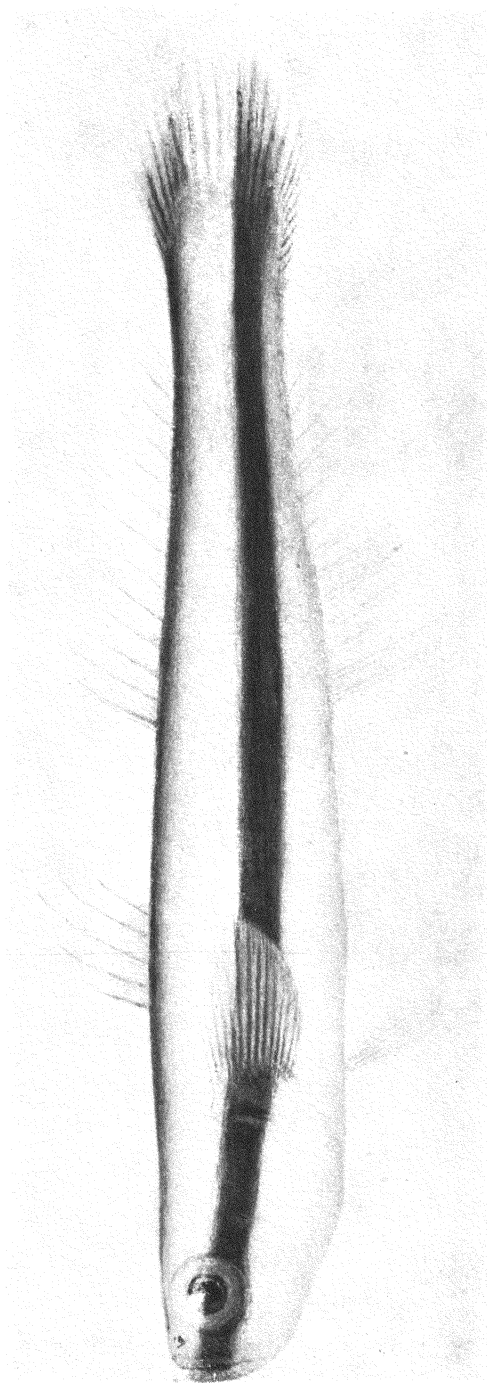


PLATE 6. HERREOLUS FORMOSUS SMITH.

THE FISHING INDUSTRY OF MARGOSATUBIG

By JOSE S. DOMANTAY

Of the Division of Fisheries

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SIX PLATES AND TWO TEXT FIGURES

Margosatubig (text fig. 1), on the coast of Igat Bay (Plate 1, fig 1), is the most important fishing center in Zamboanga Province. It forms the blind end of Dumanquilas Bay, the mouth of which opens into Celebes Sea. Apparently Celebes Sea is the source of herrings, anchovies, Spanish mackerels, chub mackerels, tuna, bonito, and many other species of fish that make Igat Bay noted as a very rich fishing ground, and the town of Margosatubig a very important fishing center in Southern Mindanao.

The richness of Igat Bay and Port Sibulan in fishes is explained by their location (text fig. 1). Appearing like a huge fish corral, they serve as the terminal pounds, Flecha Point and Olutanga Island serving as the wings leading to Dumanquilas Bay as the inclosure. Schools of anchovies and sardines pursued by larger fishes in the open sea usually seek shelter in these places.

Other fishing grounds in the neighborhood are Maligay Bay, West Talusan Bay, Gapi Bay, Silupa Bay, Tumulung Bay, and the whole neighborhood of Olutanga Island. Igat Bay is around 5.6 kilometers wide between Latas Islands and Igat Point, and extends 8 kilometers southwestward, forming a safe and commodious harbor as well as a natural abode of fishes. It is said that the herring and anchovy fisheries of Igat Bay were at one time the richest in all southern Mindanao. Now there is a marked depletion of these fishes, due apparently to the alleged rampant illegal fishing with explosives and poisonous substances, in addition to overfishing with the use of luminous lights in connection with finely woven abacá nets known locally as *pukot*.

FISHING METHODS

Pukot.—The principal gear in this bay is the *pukot* used in conjunction with strong light during dark nights. The *pukot*

(Plate 1, figs. 2 and 3; text fig. 2) is a kind of seine. The fishing outfit is composed of several vintas each with a luminous lamp, and a pukot. The pukot is made of finely woven abaca cloth and sometimes of rice sacks. It is around 20 meters long and 2 meters deep, with a pocket from 7 to 10 meters long. The proximal third of the float line is provided with wooden floats 15 by 8 centimeters, with an interval of about 30 to 40 centimeters between floats, while the distal two-thirds, which is closer to the pocket, has its wooden floats closely strung together, at an interval of from 5 to 10 centimeters (Plate 1, fig. 3). In some pukot the distal third of the pocket is made of a coarser abaca cloth of 3-millimeter mesh.

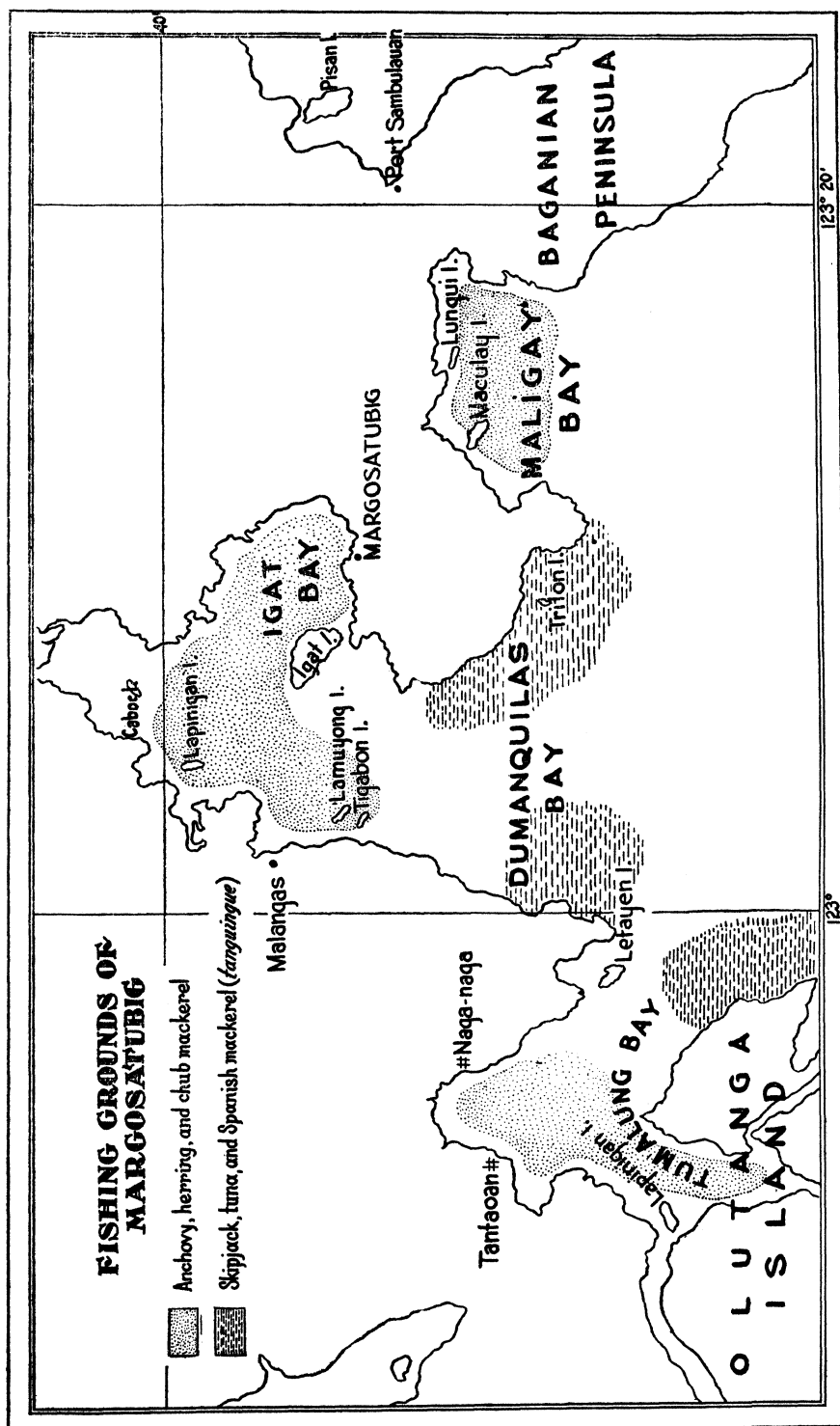
The lamp is hung from a wooden crosspiece at the bow of a vinta (Plate 2, fig. 3) manned by one or two fishermen. There are at present around 136 luminous lamps of different makes, varying from 800 to 1,800 candle power.

Vintas usually start from the shore at about 5.30 P. M. and reach the fishing ground at dusk. The luminous lamp is then set to attract the fish. The fish are kept under the rays of the light for at least two hours. Fishes subjected to strong light for some time begin to manifest signs of restlessness by twirling and twirling around, mostly in unison. This is the time when the vinta is paddled very slowly and gently toward a red light near the shore where the net is located.

It has been observed that fishes of similar size usually group together. Although the schools attracted are predominantly of one species, other species may be admixed. Schools of small anchovies, large anchovies, small sardines, large sardines, and chub mackerels, with a few squids, have been most attracted by light.

There may be as many as twenty or more fishing vintas with lights working together under one pukot. The vintas do not attract the fishes toward the net at the same time but one after another, allowing a good interval of time and distance between each, so that the fishes would not be disturbed. As a vinta leads the fishes to the net, other vintas with similar or stronger light should not pass nearby.

When a vinta approaches the net, the rays of the light are concentrated into a smaller area by means of a tin shade placed around the lamp. At the same time the light is dimmed by means of a red cloth, apparently to prevent the fishes from noticing the presence of the net and fishermen. The pukot is



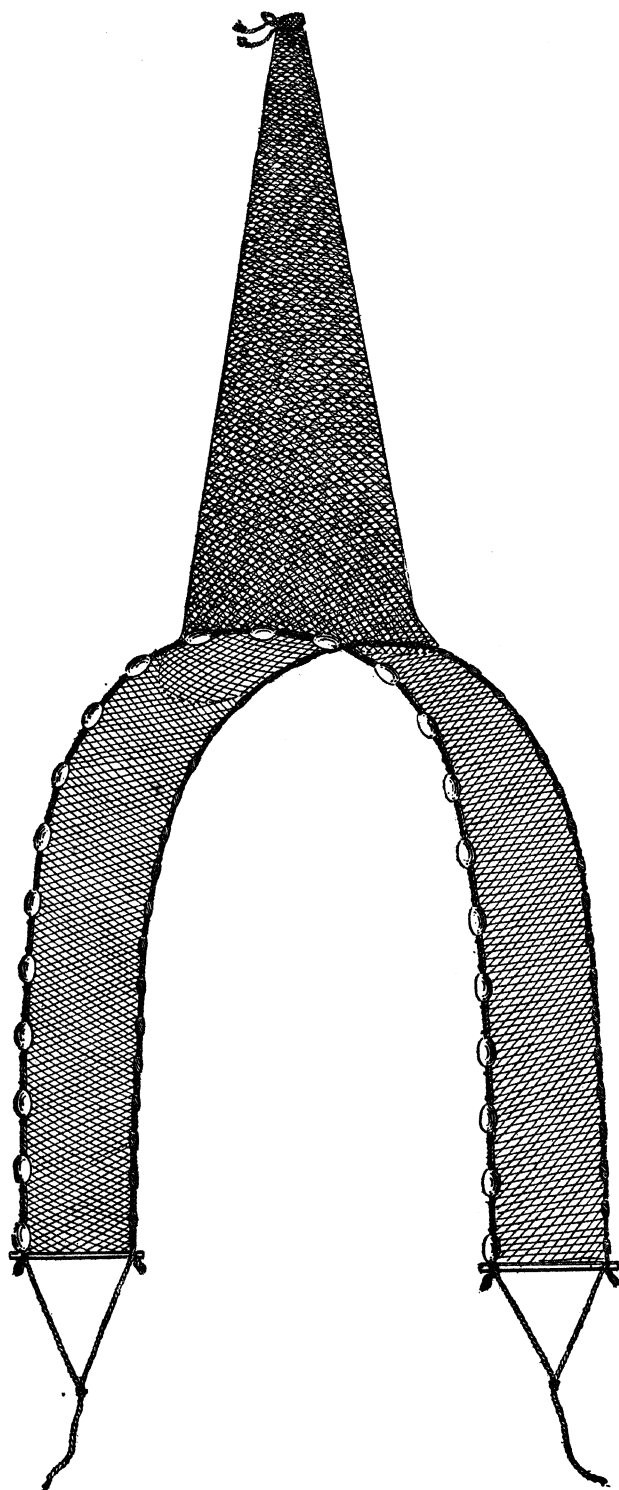


FIG. 2. Diagram of the pukot used in conjunction with fishing lamps.

usually placed in a V-shaped position against the current, with the end of one wing generally tied to a pole and that of the other usually operated by fishermen. At the middle of the net is the wide opening of the bag which narrows distally into the pocket with its opening closed by a cord. The fishes are ultimately enclosed inside the pocket from where they are emptied and loaded into the same vinta that brought the fishes to the net. After each haul the fishing vinta returns to the fishing ground and the process is repeated at least three or four times, during a dark night. During moonlight nights the vinta stays long in the fishing ground and waits for darkness, and may have only one or two operations, depending on how soon the moon goes down. The vinta may change places occasionally to look for a richer ground.

On the following morning the catches are delivered to Chinese fish dealers who own the luminous lamps and the vinta. They are measured in a bejuco basket supposedly of the same content as a petroleum can (Plate 3, figs. 2 and 3; Plate 4, fig. 1). The Chinese fish dealers merely wait at their wooden platforms or *batalan*, which are constructed adjoining their stores over the shoreline. These platforms are also used for drying fish during sunny days (Plate 4, figs. 2 and 3; Plate 5.)

The catch of a vinta is usually divided into two parts, one-half going to the owner of the lamp and the vinta, and the other half to the fishermen who are paid in cash or in terms of other commodities taken from the Chinese store. The owner of the lamp and vinta pays the owner of the net 7 centavos for every basket of fish caught. This amount in turn is divided between the owner of the net and the fishermen who operated it. One-third goes to the owner of the net and two-thirds to the fishermen.

Ampis.—The *ampis* is another fishing gear used in Igat Bay. It is made of finely woven abacá cloth, and is used in catching small shrimps (*Palæmon* spp.) known as *alamang*. The net is only used during the day. The shrimps are caught in very shallow tidal waters.

Lantao.—The *lantao* is a type of gill net, made of a regular fishing net of 1-inch (2.5 cm) mesh, which is usually used by the Moros. It is 18 meters long and 9 meters deep. It is usually anchored in deeper water and placed against the current. The float line is provided with wooden floats, and the lead line is weighted with small pieces of lead or shells.

Bobo.—The *bobo* is a small fish trap, made of bamboo, usually used by Moros (Plate 6, fig. 1).

Hook-and-line.—The hook-and-line method is used also by some Moro fishermen fishing with light.

Arrow.—The arrow is usually used with an improvised gun (Plate 6, fig. 2) in catching large fishes during the day. This is a very common fishing implement used by Moros.

Fish corral.—The fish corral (*bunsod*) is very popular among fishermen outside Igat Bay. Out of the 59 fish corrals registered in Margosatubig in 1937, only one is owned by a Christian Filipino; the rest belong to Moros. All corrals are of the ordinary simple pahubas type with three compartments. They are made of small wooden piles with bamboo matting called *banata* or *sigid*, tied together by vines called *bagin*. The *bunsod* has three heart-shaped compartments, the *sagaran* and the *ligaw*, and the terminal pound, called *bolsa*. The two wings are known as *pako-pako* and the leader is called *taktakon*. The leader is exceptionally long. These corrals are usually constructed in shallow waters about 3 meters deep. They are built at a cost ranging from 100 pesos¹ to 200 pesos. Most of them are good for only 3 to 6 months. They are constructed the year round, except in places that are exposed to strong wind throughout the year.

METHODS OF FISH PRESERVATION

As in other important fishing centers, a large quantity of fish is preserved in Margosatubig for export to other localities. Several methods of preserving fish are employed.

Bagoong or guinamos.—Bagoong, the fermented product of small fishes, is produced during rainy days. The fishes used are mostly anchovy (*bolinao*) although small sardines (*lupoy*) are used at times. Ten 5-gallon cans of fresh fish are usually mixed with $1\frac{1}{2}$ sacks (60 kilograms) of salt. The mixing is usually done in a *pandan* or bejuco mat, after which the salted fish is placed on empty petroleum cans. A wooden vat is sometimes used for the salting of fish. After the fish are placed in cans and inspected and certified by the sanitary inspector, the cans are sealed and stored for about a week before marketing.

Drying.—Drying fish is usually done during sunny days, when this method of fish preservation is more profitable than making

¹ One peso equals 50 cents United States currency.

bagoong. Depending on the amount of salt used, two methods of drying are employed.

As soon as anchovies are unloaded from the fishing boat to the drying platform (*batalan*), any larger fish, like sardines, (*tamban*), and others that may have been admixed with them, are segregated. Pandan or bejuco mats are spread over the platform and the anchovies are scattered over them for sun-drying without salting. When the day is somewhat gloomy, a small amount of salt is added in the proportion of from 1 to 2 chupas of salt per can² of fish. Drying takes place from 1½ to 2 days, depending upon the brightness of the sun. A can full of fresh fish usually nets 5 kilograms of dried fish. When there is not sufficient sunlight to dry the fishes well the partly salted fish is made into bagoong by adding more salt. This is generally known as the *bolinao* method of drying.

Dried anchovies are usually placed in sacks for marketing. Three sizes of sacks are usually used. The large-sized sack weighs 35 kilograms, the medium-sized sack, 30 kilograms, and the small sack, 25 kilograms.

In the other methods, known as sardine drying, the sardines are generally dried with salt. According to the salts used, there are the Chinese method, which is used mostly in Margosatubig, and the Filipino-Japanese method. With the Chinese method sardines are salted in a wooden vat in the proportion of 10 cans fresh fish to 1 sack (50 kilograms) Zamboanga salt. The mixture is allowed 25 hours in the wooden vat, until the salt crystals dissolve and liquefy with the juice from the fish. After salting the fishes are washed in salt water and dried for 2 days. When thoroughly dried they are placed in a wooden box. A box of dried sardines usually weighs 70 kilograms.

The Filipino-Japanese method is similar to the Chinese method, with the following improvements:

For every ganta of salt used, 1 spoonful of *salitre* (Potassium nitrate or saltpeter) is admixed. If Ilocano salt is used, 10 spoonfuls of *salitre* is added to 1 sack of salt. The mixture of fish and salt is allowed to stand in the wooden vat for at least 12 hours to allow the fish to be thoroughly salted. After salting the sardines are washed in fresh water and dried. In this method the meat almost retains its natural color. When packed in boxes the products last longer because of the absence of salt particles outside the fish.

² This is an empty petroleum can with 5 gallons capacity.

Like sardines, cavallas (chub-mackerel) are dried according to the Chinese and the Filipino-Japanese method. With the Chinese method, after the chub mackerel is split lengthwise along the middorsal line leaving the ventral side uncut, the internal organs are removed and the fish is dry-salted. Salt is sprinkled over the flesh of the fish and the salted fish are piled one over the other on a mat. The piles of salted fish are allowed to stand for at least 3 hours, washed in sea water, and dried in the sun. The fish are dried for at least 2 days before they are bundled with rattan in batches of 50 each. These are later placed inside boxes or marketed without packing, depending upon the place where they are sold.

The Filipino-Japanese method is similar to the Chinese method, except for the following: One spoonful of salitre is added to one ganta of salt and the salted fish is allowed to stand for at least one hour. The product produced with the use of salitre has a rosy or pinkish flesh and better taste.

Binoro method.—Ten cans of fresh fish, mostly large sardines or cavallas, are salted for 24 hours, with one sack of Ilocano salt mixed with 10 spoonfuls of salitre. The salted fish are arranged in layers inside a box, and another $\frac{1}{2}$ sack of the same salt, with 5 spoonfuls of salitre, placed between the layers of fish. A week later the product is marketed.

INCOME FROM FISHERIES

Although Igat Bay is still a good fishing ground, there is already a very noticeable decrease in the number of fish caught, compared with the catches of previous years. Alamang, which used to be very abundant several years ago, are hardly found today. The anchovies and herrings are now on the verge of depletion. It is believed that fishes migrate to Port Sibulan in the neighborhood of Naganaga and Tantaan. This place being newly exploited would naturally yield greater catches than Igat Bay, which has long been exploited and over-fished. Thus the fishermen from Igat Bay seeking a richer fishing ground have migrated to Port Sibulan.

The fish business in Margosatubig several years ago had an estimated value of not less than 30,000 pesos a year. From 5,000 to 10,000 18-liter cans of fermented herring and anchovies (bagoong) were prepared every month. Nowadays, hardly 500 cans are produced. The amount of dried herrings and anchovies put up monthly has also decreased considerably. A fair quantity of chub mackerels, formerly prepared into salted fish (binoro),

TABLE 1.—Common fishes and other marine products caught around Margosatubig.

Local name.	English name.	Scientific name.
Arahan (gagok).....	Sea catfish.....	<i>Arius thalassinus</i> .
Babansi (bigaong).....	Theraponid.....	<i>Pelates quadrilineatus</i> .
Bagaong (langoot).....	.....do.....	<i>Therapon jarbua</i> .
Do.....	.....do.....	<i>Therapon spp.</i>
Bagabaga (tihiktihik).....	.....do.....	<i>Myripristis melanostictus</i> .
Bebang (isda kabakaba).....	Butterfly fish.....	<i>Chætodon vagabundus</i> .
Bitilla (sompok).....	Porgy.....	<i>Lethrinus opercularis</i> ,
Bitilla (bahaba).....	Snapper.....	<i>Lutjanus fulviflamma</i> .
Cavallas.....	Chub mackerel.....	<i>Rastrelliger chrysozonus</i> .
Dalagang bukid (sulig).....	Caesio.....	<i>Cæzio cuning</i> .
Do.....	.....do.....	<i>Cæzio xanthonotus</i> .
Dumpilas (tigi).....	Anchovy.....	<i>Scutengraulis hamiltonii</i> .
Do.....	.....do.....	<i>Thrissina belama</i> .
Dilis (bolinao).....	.....do.....	<i>Stolephorus commersonii</i> .
Do.....	.....do.....	<i>Stolephorus heterolobus</i> .
Gono.....	Silverside.....	<i>Atherina duodecimalis</i> .
Do.....	.....do.....	<i>Atherina spp.</i>
Hasa-hasa (tulay).....	Mackerel.....	<i>Rastrelliger brachysomus</i> .
Katchorita (subad).....	Bonito.....	<i>Euthynnus yailo</i> .
Kataba (sumpit or sampirot).....	Archer fish or shoot- ing fish.....	<i>Toxotes jaculator</i> .
Labahita (indangan or darong).....	Surgeon fish.....	<i>Acanthurus bleekeri</i> .
Lapad (kandaman or tamban).....	Herring.....	<i>Sardinella perforata</i> .
Majuaa (gaodgaod or mulmul).....	Parrot fish.....	<i>Scarus spp.</i>
Matang baka (katambak or tulay).....	Bageye.....	<i>Selar crumenophthalmus</i> .
Mayamaya ((mangagat).....	Snapper.....	<i>Lutjanus monostigma</i> .
Mangagat.....	.....do.....	<i>Lutjanus argentimaculatus</i> .
Malakapas.....	Mojarra (gerrid).....	<i>Gerris abbreviatus</i> .
Pipicao (lapis).....	Leatherjacket.....	<i>Scomberoides toloa</i> .
Salay-salay aso.....	Crevalle.....	<i>Caranx leptolepis</i> .
Saramullete (tangbod).....	Goatfish.....	<i>Upeneides sulphureus</i> .
Saramullete (timbang).....	.....do.....	<i>Parupeneus luteus</i> .
Sapsap (lawaylaway).....	Slipmouth.....	<i>Equula equula</i> .
Tarakitok (mamsa).....	Cavalla.....	<i>Caranx malabaricus</i> .
Tarakitok (isda puti).....	.....do.....	<i>Caranx (Carangoides) gy mesteloides</i>
Tamban (kasig).....	Herring.....	<i>Dussumieria hasseltii</i> .
Do.....	.....do.....	<i>Sardinella leiogaster</i> .
Do.....	.....do.....	<i>Sardinella perforata</i> .
Do.....	.....do.....	<i>Sardinella fimbriata</i> .
Do.....	.....do.....	<i>Sardinella melanura</i> .
Do.....	.....do.....	<i>Sardinella sirm</i> .
Tambacol (panit or barellete).....	Yellowfin.....	<i>Neothunnus macropterus</i> .
Tanguingui (tanigue).....	Spanish mackerel.....	<i>Cybium commerson</i> .
Torcillo (lambana or tinduktinduk).....	Barracuda.....	<i>Sphyrna obtusata</i> .
Tuakan (bolinao).....	Anchovy.....	<i>Stolephorus indicus</i> .
Tuliŋan (puyan).....	Skipjack.....	<i>Katsuwonus pelamis</i> .
Baling (alamang).....	Shrimps.....	<i>Palæmon spp.</i>
Baliscugay (pasayan).....	.....do.....	<i>Penæus spp.</i>
Banagan.....	Spiny lobster.....	<i>Palinurus spp.</i>
Balat.....	Sea cucumber.....	Different species of <i>Holothuria</i> , etc.
Bangelan (kulabutan).....	Cuttlefish.....	<i>Sepia spp.</i>
Cangrejo (alimaŋgo).....	Crab.....	<i>Scylla serrata</i> .
Choca (pusit).....	Squid.....	<i>Loligo spp.</i>

are also no longer available. In general it has been observed that the quantity of fish caught in 1939 was much less than that caught in 1938, which in turn was much less than that caught in 1937. The fishermen themselves corroborated this marked decrease in the number of fish caught annually. The fishery products from which the income of Margosatubig from fisheries is derived are shown in Table 1.

POSSIBILITIES OF FISHERIES IN MARGOSATUBIG

The importance of Margosatubig as a fishing center has been known since the early days of Christian occupation of the locality. However, this importance is gradually diminishing, and unless present malpractices are checked, the place may ultimately disappear from the fishing map of the Philippines.

Three important factors contribute to the well-marked depletion of fishes in Igat Bay, which directly affect Margosatubig as a fishing center; the most important of these is illegal fishing with explosives and poisonous substances. During the last few years twelve major accidents due to untimely explosion have been reported. It is claimed that many more accidents of this nature have occurred but were not reported. The use of poisonous substances like *lagtang* and *tubli* is becoming popular among native fishermen who fish with luminous light.

Pukot fishing, or the use of finely woven abaca nets in conjunction with luminous lights, is undoubtedly the second factor in importance contributing to the marked depletion of fish in Igat Bay.

Water pollution is considered the third factor responsible for the depletion of fishes in Igat Bay. Decaying sawdust and other waste materials of the Mindanao Lumber Sawmill dumped along the seashore has been observed to cause the death of thousands of fish along the shore.

ILLUSTRATIONS

PLATE 1

- FIG. 1. General view of Margosatubig, showing the houses of the Chinese fish dealers and their drying platform (*batalan*).
2. A portion of the pukot, showing its long bag or pocket which is being dried on a *batalan*. In the background is the Igat Bay fishing ground.
3. A portion of the same net, showing the opening leading to the pocket, and the arrangement of the wooden floats.

PLATE 2

- FIG. 1. Fishing vintas delivering their night catch to the Chinese fish dealers in the morning at the *batalan*.
2. A fishing banca with *sapiiao*, landing its catch in the morning.
3. Some of the fishing vintas delivering their catch in the morning. The luminous lamps are shown attached to the bow of the *vinta*.

PLATE 3

- FIG. 1. A typical Moro fishing *vinta* with large fishes being dried over the roof of the boat.
2. A Moro fisherman delivering his catch to a Chinese fish dealer, showing the measuring basket claimed to be equivalent to one petroleum can.
3. A closer view of the measuring basket.

PLATE 4

- FIG. 1. Women segregating the larger fishes from an anchovy catch, showing the measuring basket.
2. Anchovies being dried on the *batalan*, showing some storehouses of Chinese dealers.
3. Another view of anchovies and herrings being dried.

PLATE 5

- FIG. 1. Dried anchovies ready to be collected and stored in storehouses.
2. *Tamban* and *bolinao* being dried on the drying platform.
3. Chub mackerel being dried on drying platform.

PLATE 6

- FIG. 1. A Moro fishing *vinta* with two fish traps (*bobo*), returning home from the fishing ground.
2. A Moro fisherman with diving goggles, demonstrating how he shoots a fish with his improvised gun loaded with a long, sharp, G. I. arrow.

TEXT FIGURES

[Drawn by Pio C. Medel.]

- FIG. 1. Map of the different fishing grounds around Margosatubig.
2. Diagram of the pukot used in conjunction with luminous lamps.

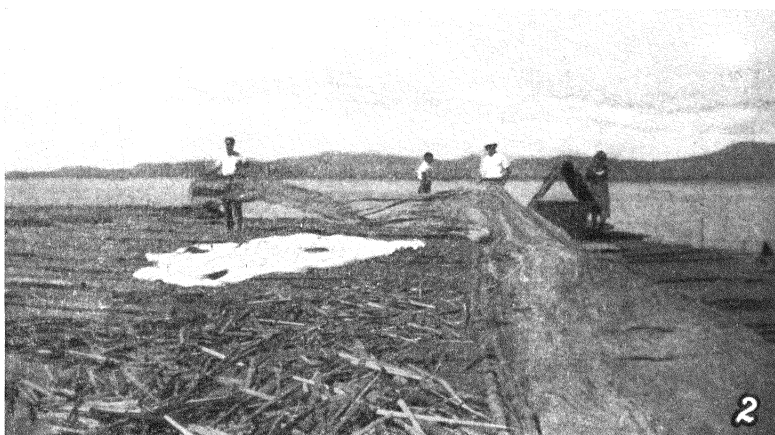
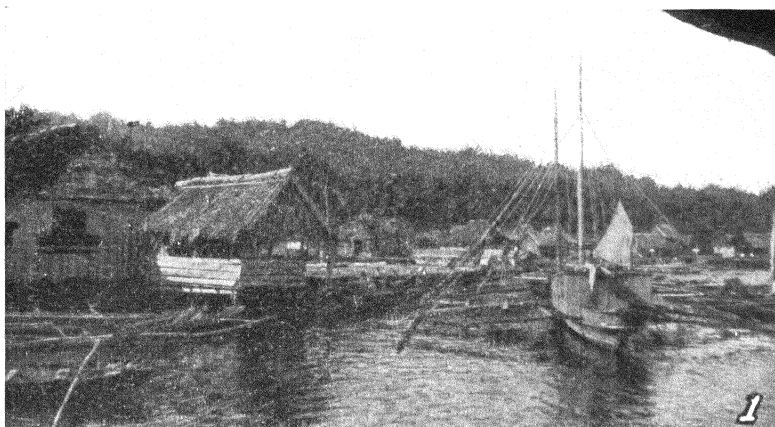


PLATE 1.

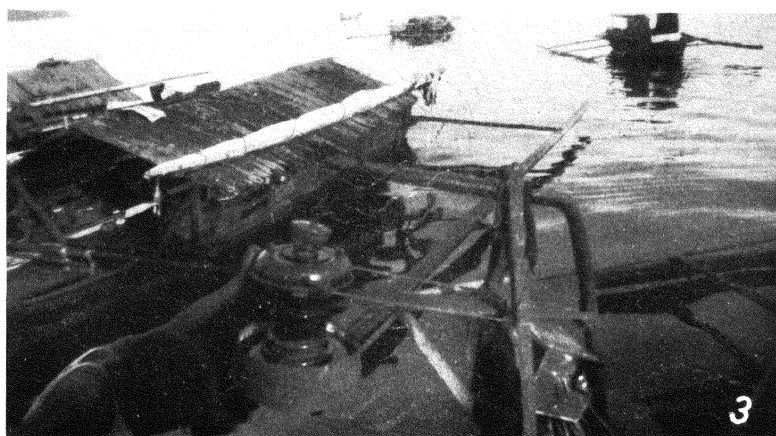


PLATE 2.



PLATE 3.

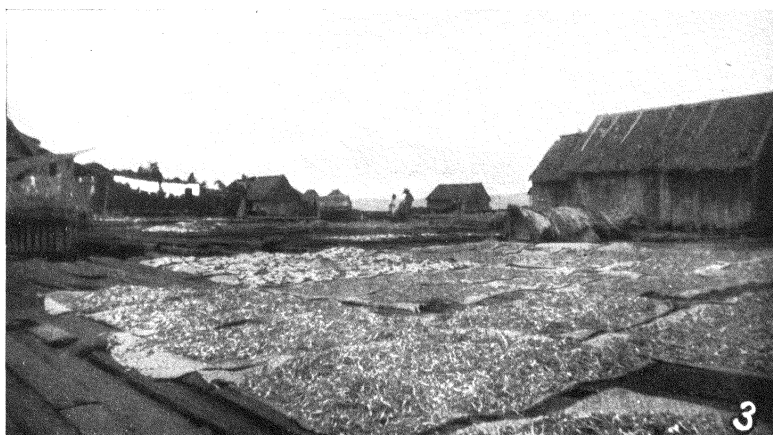
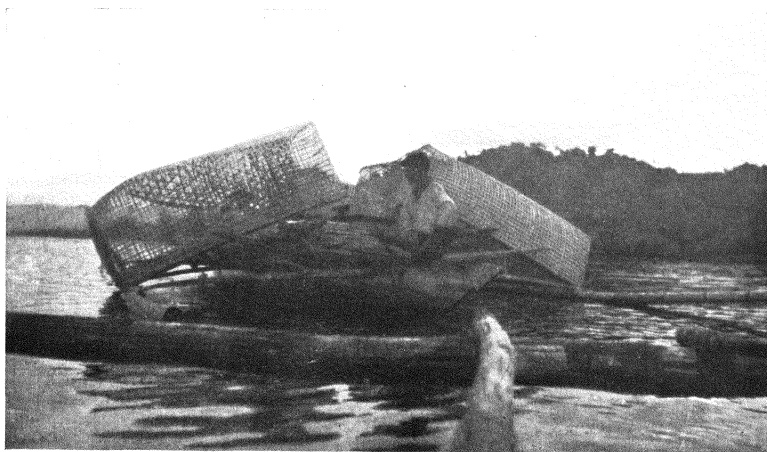


PLATE 4.



PLATE 5.



1



2

ADDITIONS TO THE APHID FAUNA OF FORMOSA (HEMIPTERA), VI ¹

By RYOICHI TAKAHASHI

Of the Agricultural Research Institute, Formosa

FIVE TEXT FIGURES

APHIS GLYCINES Matsumura.

Aphis glycines MATSUMURA, Journ. Coll. Agr. Sapporo 7 (1917) 387;
HORI, Hokkaido Agr. Expt. St. Rept. 23 (1929) 107.

Wingless viviparous female.—Yellowish green. Cornicles cylindrical, black, greenish at basal part. Cauda long, a little shorter than cornicles, pale, with 7 setæ.

Winged viviparous female.—Yellowish green. Antennal segment three with about 8 circular sensoria in a row, segment four without them. Abdomen with a black patch at base of each cornicle. Cornicles black. Cauda elongate, slightly constricted about middle, pale, with 9 long setæ.

Host.—*Glycine soja*.

Habitat.—Taihoku.

Many specimens were taken by me, September 10, 1938. New to the fauna of Formosa.

STOMAPHIS YANONIS Takahashi.

Stomaphis yanonis TAKAHASHI, Zool. Mag. Tokyo 30 (1918) 369;
Proc. Ent. Soc. Washington 21 (1919) 176; Aphid. Formosa II.
Dept. Agr. Res. Inst. Formosa Rept. 4 (1923) 139; III. ibid. 10
(1924) 116; Lingnan Sci. Journ. 9 (1930) 11.

Wingless viviparous female.—In specimens treated with caustic potash, head and prothorax brown, mesonotum with a large brown patch at middle and on each side; metanotum and basal seven abdominal tergites each with a pair of large brown patches on median area, sometimes confluent on metanotum and seventh tergite; metanotum with a brown patch on each side; basal seven abdominal tergites each with six small, transverse, dark-brown patches in a row along anterior margin; eighth abdominal tergite, cauda, and anal plate dark brown; second to sixth abdominal

¹ Part V was published in the Philip. Journ. Sci. 69 (1939) 25-33.

sternites each with a longitudinal dark-brown patch at median area; antennæ pale brown, paler on third segment; legs pale brown, sometimes darker on tarsi.

Head very short, defined from thorax, with a median suture on dorsum; each lateral part of dorsum of head defined distinctly from median area by a suture, on which eye is located. Eyes small, not protruding; three large facets representing ocular tubercles distinctly protuberant, sometimes longer than wide. Antennæ with many fine setæ, which are shorter than

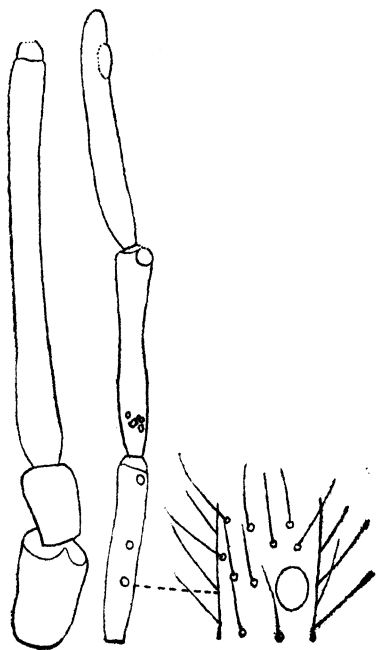


FIG. 1. *Stomaphis yanonis* Takahashi.
Wingless viviparous female; antenna.

width of third segment; segment one stout, distinctly longer than wide, somewhat widened distally, much longer than setæ on body, dark, without setæ on basal half; segment two much smaller than segment one, narrowest near base; segment three much narrower than fore tibiae, slightly swollen near base in many individuals, constricted at base, lacking sensoria; segment four very slightly narrowed towards base, with one to four small circular sensoria in a row, these sensoria sometimes entirely wanting; segment five constricted about middle and at base, with one to four small irregular sensoria on basal part, these sensoria sometimes wanting; segment six with a large, longitudinally oval sensorium, without accessory sensoria,

not narrowed on the distal part; relative lengths of segments: III—42, IV—17, V—22, VI—24. Cornicles on large, dark-brown, hairy cones, diameter nearly length of dorsal setæ of body; cones on distal part with many smaller setæ mixed with fewer long setæ, long setæ as long as dorsal setæ of body, longer than antennal setæ, transverse diameter less than longitudinal. Femora well defined from trochanters; anterior tarsi rounded on dorsal side, distal segment about twice as long as basal segment; hind tarsi slightly longer than last antennal segment, distal segment about thrice as long as basal.

Body about 5 mm long.

Host.—*Celtis* sp., attacking the stem.

Habitat.—Sakahen, Karenko Prefecture.

Many specimens sheltered by an ant, *Lasius* sp., were taken by me August 7, 1939. Previously known only from China and Japan (Honsu).

As the original description is in Japanese and rather brief, the redescription is here given from the Formosan specimens, which exactly agree with the Japanese forms. Easily distinguished from *Stomaphis liquidambaris* Takahashi by the cones of cornicles being well defined, by the shorter hind tarsi, and by the dorsum of the body not dark throughout in specimens treated with caustic potash.

PARATRICHOSIPHUM NIITAKAENSE Takahashi.

Paratrichosiphum niitakaense TAKAHASHI, Philip. Journ. Sci. 63 (1937) 5.

Winged viviparous female.—Antennal segment three a little imbricated, somewhat stouter than tibiae, slender, with 24 to 26 large, transversely oval sensoria arranged in a row along whole length, and with about 22 long setae; segment four with about 5 setae, lacking sensoria; relative length of antennal segments: III—50, IV—15, V—17, VI—12+?.

Body about 2 mm long, forewing about 3.25, cornicle about 1.3.

Host.—*Quercus* sp.; attacking the young leaf and shoot.

Habitat.—Mount Noko (about 8,000 feet).

A single alate and four apterous females were collected by me, August 6, 1939. The original description was prepared from the specimens with broken antennae and the above supplementary notes are given. The specimens from Mount Noko are larger than those from Niitaka. Differs from *Paratrichosiphum tenuicorpus* Okajima

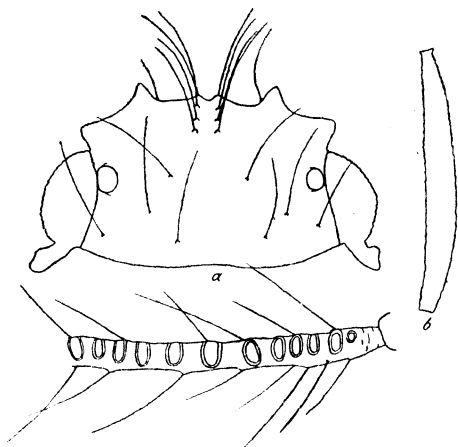


FIG. 2. *Paratrichosiphum niitakaense* Takahashi. a, winged viviparous female, head; b, winged viviparous female, basal part of antennal segment three; c, wingless viviparous female, cornicle with hairs removed.

in the cornicles being shorter, narrowed basally and pale in the apterous form, the larger oval sensoria on antennal segment three in the alate form, and in other respects. Easily differentiated from *Paratrichosiphum lithocarpi* Takahashi in the shape of cornicles, which are longer, and broadest at the base and narrowed towards the apex. Among the Formosan species of *Paratrichosiphum* the cornicles of the apterous form are pale (whitish or yellowish) in *P. niitakaense* Takah., *P. lithocarpi* Takah., and *P. tattakanum* Takah., and sometimes also in *P. tenuicorpus* Okajima.

EUTRICHOSIPHUM ELONGATUM sp. nov.

Wingless viviparous female.—Pale yellow, antennæ, legs, and cornicles pale. Body elongate, about twice as long as wide, broadest about middle of abdomen, with many very long, fine, simple setæ, and numerous minute granules on venter, and on anterior parts of meso- and metanotum and basal three abdominal tergites. Head widely convex at middle of front, with about 14 setæ on dorsum, a few of which are sometimes much shorter;

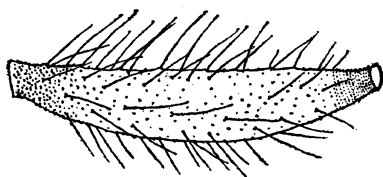


FIG. 3. *Eutrichosiphum elongatum* sp. nov.
Wingless viviparous female; antenna.

frontal setæ longer than basal two antennal segments taken together. Frontal tubercles very short, distinct. Eyes normal. Antennæ slender, about $1\frac{1}{2}$ as long as cornicles, 5-segmented, with many long setæ, longer setæ nearly as long as dorsal setæ of head; segment three imbricated, longer than width of head including eyes; segment four with 3 or 4 setæ; segment five with 2 long setæ on basal part and 6 accessory sensoria in a group; relative lengths of segments: III—32, IV—10, V—9+12. Rostrum reaching hind coxæ. Pronotum fused with head, with many setæ, most of these on marginal area. Abdominal segments except basal and distal few segments fused, with many long dorsal setæ, which are as long as those on the head and not in rows; lateral setæ a little longer; a pair of long setæ present between cornicles; seventh tergite with a lateral seta; eighth tergite with 2 median setæ. Cornicles large, stout, about five times as long as wide, broadest about middle, narrowed towards both ends, narrowest at apex, rounded on one side, not striate or reticulate, as long as hind tibiæ, much longer than width of head, shorter than width of abdomen, distinctly longer than antennal segment three, with many micro-

trichiae, these much fewer on middle part, and with many long bristles, these as long as dorsal setae of body, not branched, absent on basal and distal small parts, and a little longer than, or as long as, width of cornicles. Caudal segment very short, lacking a process, with about 8 long bristles on hind margin. Trochanters defined from femora; femora imbricated on one side of distal half; tibiae stouter than third antennal segment, with 3 slender spinelike setae at tip, and some setae which are as long as width of tibiae; hind tibiae distinctly striate; tarsi with some long setae on basal segment.

Body 2.5 mm long, antenna about 1.25, cornicle about 0.9.

Host.—*Quercus* sp., attacking the lower side of young leaf and the young shoot.

Habitat.—Higashinoko, Karenko Prefecture.

Many specimens were collected by me August 6, 1939. This species possesses 5-segmented antennae and is referred to the genus *Eutrichosiphum* Essig et Kuwana, though differing much from the known species of the genus in the elongate and pale body, in these respects resembling some species of *Paratrachosiphum* Takahashi.

SHIVAPHIS ARUNDINARIAE sp. nov.

Winged viviparous female.—White, slightly dusky on thorax, without markings on abdomen, with cottony secretions on anterior part of body, on hind legs, and slightly on antennae. Antennae pale, very slightly dusky on basal two segments; legs, cornicles, cauda, and anal plate pale. Forewings a little clouded along first oblique vein, and distal parts of second and third; hind wings slightly so along oblique veins; stigma pale, darker at basal and distal parts; veins pale. Body oblong, soft, without long setae and granules. Head with a few small simple setae on dorsum, lacking a ventral projection; front slightly convex at middle above ocellus. Frontal tubercles short, but distinct, somewhat wider than space between them, divergent on mesal side. Eyes large, with ocular tubercles. Antennae very long, slender, narrowed distally, with a few short, simple setae, which are shorter than width of segment three; segment one about $1\frac{1}{2}$ times as long as wide, much larger than segment two, not convex mesally; segment two longer than wide; segment three very long, shorter than fore tibiae, a little narrowed towards apex, not striate, without microtrichiae, with 5 to 9 sensoria in a row on basal two-fifths except at basal part, these sensoria small and transversely oval; segment four without sensoria; segments five and six striate; distal part of segment six short.

about 5 times as long as wide, scarcely tapering; primary sensoria small, circular; relative length of segments: I—7, II—5, III—47, IV—25, V—21, VI—16+4. Rostrum short, stout, not reaching middle coxæ, distal segment nearly as long as wide, tapering; clypeus not convex. Dorsal tubercles wanting. Abdomen with many small wax pores around cornicles. Wings long; stigma short, truncate; stigmatic vein obsolete or absent; third oblique vein twice branched; hind wings with two somewhat divergent oblique veins and three hooklets. Cornicles very

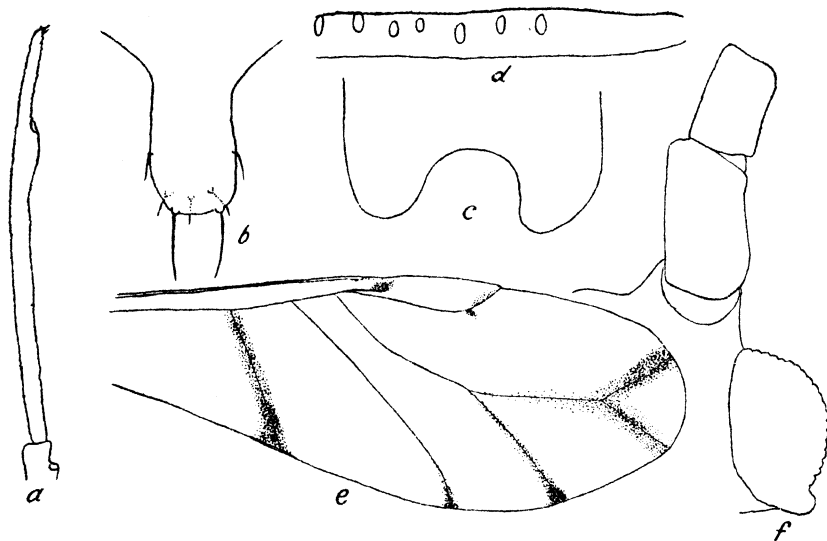


FIG. 4. *Shivaphis arundinarie* sp. nov., winged viviparous female. a, last antennal segment; b, cauda; c, anal plate with hairs removed; d, basal part of third antennal segment; e, forewing; f, head.

short, almost mere rings, rather large in diameter. Cauda as long as anal plate, somewhat constricted basally, somewhat knobbed, rounded apically, with a pair of stouter setæ at apex. Anal plate deeply divided, U-shaped; lobes parallel, as wide as cauda. Legs long, slender; trochanters distinct; fore and middle femora constricted near base; all femora with many mosaiclike markings (wax pores?) on distal part; tibiæ stouter than distal part of third antennal segment, with about three slender spines at tip, and some simple setæ, which are as long as width of tibiæ; hind tibiæ distinctly stouter than other tibiæ, somewhat narrowed towards apex, densely with faint mosaiclike markings (wax spores?) over whole surface; tarsi with spinules in rows, some setæ on basal segment; hind tarsi much shorter than basal part of last antennal segment; empodial setæ not expanded.

Body about 2 mm, head including eyes about 0.392 mm wide, 0.2 mm long at median part, antenna 2.1 mm long, antennal segment three 0.76 mm long, 0.037 to 0.04 mm wide near base, forewing 3 mm long, cornicle including margin 0.06 mm in diameter at apex, cauda including basal part 0.092 mm long, anal plate 0.135 mm wide, hind tibia 1.4 mm long, 0.051 to 0.055 mm wide about middle, hind tarsus 0.15 mm long.

Host.—*Arundinaria* sp., attacking the lower side of leaf.

Habitat.—Taiheizan (Mount Taihei), Mururoafu, Shin-Taiheizan.

Some specimens were collected by me in September, 1938 and 1939. This species is the second member of the genus *Shivaphis* Das, and differs from *S. celti* Das in the coloration, the larger cornicles, the head not indented at middle of front and without wax pores, frontal tubercles more developed, antennæ without discernible wax pores, antennal segment three with sensoria near base, legs longer, and in other respects. Very scarce, occurring in small numbers.

Arundinaria is very abundant on high elevation in Formosa, and seven species of aphids are now known to attack it at high altitudes in the island, namely, *Cranaphis formosanus* Takahashi, *Myzocallis arundinariæ* Essig, *Shivaphis arundinariæ* sp. nov., *Aphis arundinariæ* Takahashi, *Cerataphis bambusifoliæ* Takahashi, *Ceratovacuna arundinariæ* Takahashi, and *Oregma tattakana* Takahashi, of which *Myzocallis arundinariæ* Essig and *Cerataphis bambusifoliæ* Takahashi occur also in the lowlands.

CERATOVACUNA BREVICORNIS sp. nov.

Wingless viviparous female.—Brownish pink, densely covered with wax, which forms tassels along margin. Body without granules on dorsum. Head thickened on derm of anterior part, with about 15 very long, fine setæ on frontal area, these setæ about $1\frac{1}{2}$ times as long as antennal segment one; a pair of similar setæ present between dorsal groups of wax pores and postlaterad of these groups; over 10 similar setæ on anterior part of venter, of which a foremost pair is longer. Frontal horns very small, triangular, often much wider than

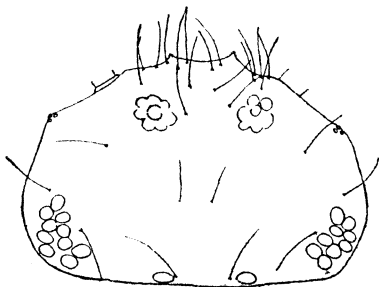


FIG. 5. *Ceratovacuna brevicornis* sp. nov.; winged viviparous female. Head and prothorax.

long, pointed apically, much shorter than second antennal segment, variable in length. Eyes composed of three facets, a little protruding. Cephaloprothorax much wider than long, a little constricted at hind part. Antennæ shorter than width of prothorax, but longer than space between them, slightly shorter than fore tibiæ, 4-segmented; segment three narrowed on basal part, slightly or scarcely imbricated, about $1\frac{1}{2}$ times as long as segment four, with a few short setæ; segment four narrowed basally. Rostrum not reaching fore coxæ; distal segment a little longer than wide, blunt at apex, with two pairs of long bristles about middle and a pair of much shorter, stiff, distal bristles. Meso- and metanotum and basal six abdominal segments each with 4 long, fine setæ in a row; abdominal segment seven with a pair of similar setæ on median area; these setæ as long as those on head. Abdomen broadest on segment three, segments three to five fused. Cornicles rather large in diameter, not on sclerotised parts, much larger than wax pores, slightly but distinctly separated from the lateral groups of wax pores, not surrounded with setæ. Cauda constricted basally, much wider than long, about twice as wide as diameter of cornicles, with about 15 setæ. Anal plate divided, lobes narrower than cauda, with about 6 setæ. Trochanters not defined from femora; femora with some long, fine setæ, which are shorter than width of femora; tibiæ stouter than third antennal segment, with some fine setæ; tarsi as long as last antennal segment, a little imbricated; fore tarsi with 2 stiff median and 2 much longer lateral setæ on basal segment; middle and hind tarsi with 2 long setæ on basal segment; tarsal digitules very long, slightly capitate. Ventral setæ of abdomen shorter, but more in number than dorsal setæ, not in rows. Wax pores well developed, large, well defined except for those on head, present in a large group on each side of each of thoracic and basal seven abdominal segments, in a large median group on abdominal segment eight, and in a pair of smaller groups on dorsum of head, thorax, and basal abdominal segment; each group of wax pores on a sclerotised area; each lateral group with a long seta, median group on abdominal segment eight with 2 long setæ closely placed; numbers of wax pores in each group about as follows: Lateral group: prothorax, 7 to 9; mesothorax, 6 or 7; metathorax, 7 or 8; abdominal segment one, 6 or 7; abdominal segment two, 9 or 10; abdominal segment three, 10 to 13; abdominal segment four, 10 or 11; abdominal segment five, 11 to 13; abdominal segment six, 13 to 15; abdominal segment seven, 17.

Dorsal group: head, 7 or 8; prothorax, 1; mesothorax, 1 to 3; metathorax, 1 or 2; abdominal segment one, 1 or 2; abdominal segment eight, 24 to 28. Body about 1.5 to 1.8 mm long.

Host.—*Bambusa* sp., attacking the lower side of leaf at some distance from the apex.

Habitat.—Suisha, Taichu Prefecture.

Many specimens were taken by me August 4, 1939. This species is characterized by the minute horns on the front, and by the presence of dorsal wax pores on the thorax and the basal abdominal segment. The nymph of the first instar possesses long slender horns on the front, which are longer than the basal two antennal segments taken together and parallel, and the anterior femora not expanded. In *Ceratovacuna longifila* Takahashi, horns on the front longer, setæ in the group of wax pores on abdominal segment eight very far separated, thorax and basal abdominal segment lacking dorsal wax pores.

This new aphid has the very peculiar habit of grouping very densely on the lower side of the leaf at some distance from the apex.

The materials upon which the present paper is based are deposited in the author's collection.

ILLUSTRATIONS

TEXT FIGURES

- FIG. 1. *Stomaphis yanonis* Takahashi. Wingless viviparous female; antenna.
2. *Paratrachosiphum niidakaense* Takahashi. a, winged viviparous female, head; b, winged viviparous female, basal part of antennal segment three; c, wingless viviparous female, cornicle with hairs removed.
3. *Eutrichosiphum elongatum* sp. nov. Wingless viviparous female; cornicle.
4. *Shivaphis arundinariæ* sp. nov. Winged viviparous female. a, last antennal segment; b, cauda; c, anal plate with hairs removed; d, basal part of third antennal segment; e, forewing; f, head.
5. *Ceratovacuna brevicornis* sp. nov. Winged viviparous female; head and prothorax.

MORPHOLOGICAL STUDIES ON VARIOUS PHILIPPINE HETEROPHYID METACERCARIÆ WITH NOTES ON THE INCIDENCE, SITE, AND DEGREE OF METACER- CARIAL INFECTION IN THREE SPECIES OF MARINE FISH.¹

By ANA VAZQUEZ-COLET and CANDIDO M. AFRICA

Of the Institute of Hygiene, University of the Philippines, Manila

TWO PLATES

Simultaneously with the systematic examination of fish for metacercariæ as a preliminary step in selecting material for feeding experiments to determine the piscine intermediate hosts of Philippine heterophyid trematodes,(9,10) we have undertaken a study on the morphology of the metacercariæ found in every species of fish that we have experimented with, in order to correlate, verify, and integrate our findings. We have also determined the incidence, site, and degree of metacercarial infection in three species of marine fish.

Close scrutiny of the metacercariæ obtained from the various fish used in our feeding experiments proved invaluable for orientation purposes in checking up the results of the experiments. Thus we soon discovered that not all of the species of metacercariæ obtained from a given fish and fed to a given animal develop and mature in the latter. This finding suggested the necessity of diversification of the experimental hosts. Incidentally, Ciurea(5) classifies hosts into three categories; namely, favorable, unfavorable, and refractory: favorable hosts being those in which the parasite can become ovigerous; unfavorable, those in which the parasite cannot become ovigerous; and refractory animals, those in which the parasite cannot develop at all. Comparison of the adult heterophyids recovered in our feeding experiments with the homologous metacercariæ harbored by the species of fish which furnished the metacercariæ used in

¹ Aided by a special research grant from the Board of Regents, University of the Philippines.

the feeding experiments enabled us to verify that these trematode larvæ, except for sexual immaturity, are exact miniatures of their adults. Hence, by identifying the metacercariæ in a given species of fish, it is possible to tell the species of trematodes of which it is the second intermediate host.

A description of seven species of metacercariæ studied by us, and an account of the incidence, site, and degree of metacercarial infection in three species of marine fish that furnished some of the metacercarial species studied, will be the subject of this report. The metacercariæ herein described are the following: *Stictodora guerreroi*, *Stictodora manilensis*, *Haplorchis calderoni*, *Haplorchis sisoni*, *Haplorchis yokogawai*, *Stellantchasmus falcatus* (= *Diorchitrema pseudocirrata*), and *Stamnosoma formosanum*. The three species of fish studied as to incidence, site, and degree of metacercarial infection are *Hepsetia balabacensis* Jordan and Hubbs, *Hemiramphus georgi* Cuvier and Valenciennes, and *Ambassis buruensis* Bleeker.

TECHNIC

The fish to be dissected was carefully washed in tapwater several times, the whole, or a part, of it, according to the site selected for study, placed in a small Petri dish, and a little salt solution added. Under a dissecting microscope, by means of teasing needles, the metacercariæ were dissected away from the tissues, fished out by means of a fine pipette provided with a rubber nipple, placed in a drop of salt solution, on a clean slide, covered with a thin cover glass, and examined under the compound microscope, under low and high powers. The sites from which the metacercariæ were obtained were carefully noted down, measurements were taken with the ocular micrometer, sketches made of the metacercariæ, and all observations written down right by the microscope. Precautions were taken against drying of the smears by adding salt solution from time to time, or by vaselining the edges of the cover glass. Whenever it was desired to excyst the metacercariæ herein described, gentle tapping of the cover glass generally sufficed to effect their excystment. The liberated metacercariæ were studied in the fresh state, sometimes tinged with eosin alcohol. In counting the metacercariæ a fine pipette provided with a rubber nipple was used for picking them up and transferring them from one container to another.

RESULTS

THE METACERCARIA OF STICTODORA GUERREROI GARCIA AND REFUERZO, 1936⁽⁶⁾
(PLATE 1, FIGS. 1 AND 2)

By feeding experiments(9,10) we have determined that this metacercaria is harbored by *Hepsetia balabacensis* Jordan and Hubbs, *Hemiramphus georgi* Cuvier and Valenciennes, *Ambassis buruensis* Bleeker, and *Mugil dussumieri* Cuvier and Valenciennes. By actual dissection we have ascertained its parasitization in various sites of the body of the above fish. We have dissected it from the interradiat tissue of the caudal fin, flesh, abdominal cavity, aorta, heart, muscles of the eye ball, and soft tissues of the jaws of *Hepsetia balabacensis*; from the flesh, abdominal cavity, aorta, and heart of *Ambassis buruensis*; and from the interradiat tissue of the caudal fin, flesh, abdominal cavity, aorta, and heart of *Hemiramphus georgi*. In the abdominal cavity of these fish they occur free or more or less loosely attached to the viscera. Not infrequently they surround the heart and aorta, quite firmly attached to the latter, and sometimes they are actually embedded in the heart muscle. In *Hepsetia balabacensis* this localization in the vicinity of the heart seems actually to amount to a predilection, so much so, that the heart alone may show as few as two metacercariæ snugly nestling in its pericardium after minute dissection of the rest of the fish's body has failed to show the metacercariæ elsewhere. In the flesh they are always more abundant near the caudal fin. They are easily dissected away from the tissues, to which they are not firmly attached. To the naked eye they appear as tiny, opalescent-white, ellipsoidal or rounded grains, which under the dissecting microscope show as tiny, biconvex, transparent cysts harboring a blackish-brownish, actively moving, coiled-up, or only slightly curved or bent, larva which more or less completely fills up the cyst cavity. The anterior portion of the worm is brownish and its posterior half is blackish. Under the low power of the compound microscope the cyst wall is thin, hyaline, transparent. Except in very young metacercariæ, which lie straight, the larva is found flexed upon its ventral aspect within the cyst. It is oblong in shape and moves briskly, turning around the center of the cyst sidewise or headwise. Particles and spherules of various sizes in varying numbers are present in the liquid bathing the larva within the cyst cavity. In a good specimen, with the larva favorably posed and vision unmolested by these particles, all the organs of the encysted worm can be

distinguished, and the trematode specifically identified, even under low power, as *S. guerreroi*, the gonotyl armature standing out conspicuously as a tiny, blackish horseshoe at a point about the middle of the body of the worm. Cuticular spines are present, except at the posterior pole. They are quite prominent and abundant at the anterior half of the body of the worm, and diminish gradually in size and number as the posterior pole is reached. At the anterior extremity of the worm is seen the oral sucker subterminally placed and giving rise to a rather long prepharynx which leads into an ellipsoidal pharynx. The œsophagus, not quite as long as the prepharynx, arises from the pharynx and bifurcates into two slender cæca which, following the lateral portions of the body, proceed posteriorly to where they end blindly, one on either side of the excretory vesicle near the posterior extremity of the body. The excretory vesicle has the form of a Y, the two arms of which are prolonged anteriorly, one on either side of the body, to the base of the oral sucker. In the third fourth portion of the body of the larva, in the space enclosed by the arms of the excretory vesicle and the cæca, are contained the anlage of the ventrogenital sac, the testes, ovary, and receptaculum seminis. The testes are obliquely placed, the right being the more posterior. Immediately anterior to the right testis is the anlage of the ovary, and close to the right testis, between it and the left testis, is seen the tiny anlage of the receptaculum seminis. From the anterior borders of the testes two fine tubes, one for each testis, arise and unite anteriorly to form a single tube which widens out into a small sausagelike organ, the anlage of the seminal vesicle, which ends in the anlage of the ventrogenital sac, a pyriform organ situated about the middle of the body of the larva, at the point where the worm lies bent on itself. The ventrogenital sac bears a conspicuous, incomplete circle of thickly-set spines, which, being nearly as well developed as those found on the gonotyl of the adult, make it possible to identify the species of the metacercaria as *Stictodora guerreroi*. Fine spherules fill the digestive tract and excretory vesicle, and are constantly being discharged from the oral sucker and the excretory pore into the liquid bathing the larva within the cyst. Brownish pigment granules are scattered under the cuticle throughout the body, especially at the anterior portion, and in young metacercariæ conspicuous brownish to blackish eye spots are seen on the prepharynx, generally one on either side. Flame cells, visible with the oil immersion lens,

are distributed symmetrically throughout the body of the larva. By high power the anlage of the uterus is detectable in the form of a transparent tubule visible between and behind the testes, while the anlage of the metraterm is recognizable in the form of a transparent, delicate tube leading to the ventrogenital sac anlage.

The size of the fresh cysts, as determined from metacercariæ dissected from various body sites of the fish mentioned above, ranges from 0.206 to 0.612 mm in length and from 0.149 to 0.527 mm in width. The thickness of the cyst wall averages 0.0027 mm. The excysted metacercariæ range from 0.548 to 1.295 mm in length and from 0.142 to 0.498 mm in width. The various organ anlage gave the following measurements: the oral sucker, 0.053 to 0.071 mm longitudinally by 0.062 to 0.085 mm transversely, averaging 0.061 by 0.074 mm; the prepharynx, 0.081 to 0.146 mm by 0.007 to 0.014 mm, average 0.113 by 0.01 mm; the pharynx, 0.05 to 0.057 mm long by 0.04 to 0.05 mm wide, or 0.052 by 0.044 mm; the cesophagus, 0.053 to 0.128 mm long by 0.008 to 0.021 mm wide, or 0.091 by 0.015 mm; the ventrogenital sac, 0.057 to 0.083 mm longitudinally by 0.06 to 0.1 mm transversely, or an average of 0.073 by 0.08 mm, the longest spines on the gontyl measuring 0.013 mm; the right testis, 0.071 to 0.085 mm longitudinally by 0.071 to 0.1 mm transversely, or 0.08 by 0.088 mm; the left testes, 0.06 to 0.078 mm longitudinally by 0.071 to 0.1 mm transversely, or 0.07 by 0.082 mm; the ovary, 0.03 to 0.05 mm longitudinally by 0.03 to 0.043 mm transversely, or 0.041 by 0.038 mm; the seminal receptacle, 0.043 mm in diameter.

THE METACERCARIA OF STICTODORA MANILENSIS AFRICA AND GARCIA, 1935⁽²⁾
(PLATE 1, FIGS. 3 AND 4)

By feeding experiments (9, 10) we know that *Hepsetia balabacensis* Jordan and Hubbs, *Ambassis buruensis* Bleeker, *Mugil dussumieri* Cuvier and Valenciennes, *Therapon plumbeus* (Kner), *Gerris filamentosus* Cuvier and Valenciennes, *Pelates quadrilineatus* (Bloch), and *Therapon jarbua* (Forskål) (results with last-named fish not yet published) harbor the metacercariæ of *Stictodora manilensis*. By actual dissection we have found the metacercariæ in the caudal fin, flesh, and abdominal cavity of *Ambassis buruensis* and *Hepsetia balabacensis*, and in the abdominal cavity of *Mugil dussumieri* and *Gerris filamentosus*. In the caudal fin they are found in the interradiat tissue. As many as 15 metacercariæ were found in the caudal fin of one tiny

Hepsetia balabacensis 6 cm long. In the abdominal cavity they occur free or loosely attached to the surface of the viscera. In the region of the heart they are found free by it, or attached to the aorta, or actually embedded in the heart muscle. They are easily dissected away from the tissues which apparently show no reaction to the presence of the parasite.

With the exception of the spiny armature and the rudimentary ventral sucker of the ventrogenital sac, the anatomical description given above of the metacercaria of *Stictodora guerreroi* applies equally well to that of *Stictodora manilensis*. We shall, therefore, limit ourselves to describing the gonotyl garnishings and its rudimentary ventral sucker. The smaller (left) portion of the transversely placed, ovoid ventrogenital sac is occupied by a fanlike figure formed by 15 to 17 spines not unlike the hooklets garnishing the rostellum of *Dipylidium caninum*, the wider portions of the spines being attached, while the narrower, free, ends converge at the left end of the ventrogenital sac to form the vertex of the fanlike figure formed by the spines. The attached bases of the spines are apparently implanted on one and the same tissue stratum, on a common level. Just how many rows the spines form on this common basic stratum could not be determined, but it seems that they do not form a linear row, but rather a zigzagging row, alternating or overlapping of the spines being apparent at their insertions. They partly encircle and hide from view a tiny, button-hole-like structure, which is apparently the rudimentary ventral sucker described in the adult by Africa and Garcia.⁽²⁾ The conspicuous fanlike figure formed by the spines of the gonotyl, by which the metacercariæ are identified, is visible, even under low power, at a point below the transverse middle level of the body of the larva.

Measurements taken on fresh metacercariæ of *S. manilensis* obtained from various body sites of various species of fish gave the following figures: The cysts range from 0.199 to 0.484 mm in length, and from 0.142 to 0.420 mm in width; the ventrogenital sac varies from 0.03552 to 0.04588 mm transversely and from 0.0296 to 0.03404 mm longitudinally; the hyaline cyst wall ranges from 0.00111 to 0.00373 mm in thickness, the average thickness being 0.002759 mm; the longest spines on the gonotyl range from 0.0074 to 0.01184 mm in length; the rudimentary ventral sucker measures 0.014985 mm transversely and 0.011655 mm longitudinally; the oral sucker 0.068 and 0.062 mm in the transverse and longitudinal directions, respectively; the pharynx

0.03996 mm transversely and 0.04588 mm longitudinally; the particles floating in the cyst fluid vary from very minute to 0.011665 to 0.01665 mm. When the fresh cysts are treated with eosin alcohol, the large particles appear as pink, opaque, homogeneous masses, while the majority of the small particles are bright and nonstaining. The excysted metacercariæ vary in length; one measured in the quiescent state was 0.797 mm long and 0.342 mm across.

THE METACERCARIA OF *HAPLORCHIS CALDERONI* AFRICA, 1938⁽¹⁾ (PLATE 1, FIGS. 5 AND 6)

Feeding experiments (9, 10) have demonstrated that *Hepsetia balabacensis* Jordan and Hubbs, *Hemiramphus georgi* Cuvier and Valenciennes, *Ambassis buruensis* Bleeker, *Mugil dussumieri* Cuvier and Valenciennes, *Ophicephalus striatus* Bloch, *Glossogobius giurus* Buchanan-Hamilton, *Gerris filamentosus* Cuvier and Valenciennes, *Creisson validus* Jordan and Seale, *Anabas testudineus* (Bloch), *Pelates quadrilineatus* (Bloch), *Teuthis javus* (Linnæus), and *Eleutheronema tetradactyla* (Shaw) are piscine intermediate hosts of *Haplorchis calderoni*. For the study of the metacercariæ dissections were made of three of the above-listed fishes; namely, *Hepsetia balabacensis*, *Anabas testudineus*, and *Creisson validus*. These three fishes showed the metacercariæ in the flesh, and *Creisson validus* also showed them in the soft tissues between the gills.

To the naked eye the metacercariæ appear as very tiny whitish grains which under low power show as biconvex, thin, transparent cysts completely filled up by a light-brownish, actively whirling larva which bristles with scalelike spines arranged in quinquex over the anterior three-fourths of its cuticle, is bent upon its ventral aspect, and is partly hidden by a conspicuously black material occupying a great part of its posterior portion. This black material, abounding in spherules, actually fills the globular, greatly distended excretory tube. The intestinal cæca, filled up with a single rouleau of transparent, uniformly-sized discs which move up and down, and back and forth, rhythmically with the contractions of the larva, at once engage the attention of the examiner. To identify the parasites it is necessary to examine them when they excyst, which they do spontaneously some time after they have lain underneath a thin cover glass. The excysted larva is pyriform, widest posteriorly. It moves actively, and its banana-shaped longitudinally striated expulser is conspicuous, situated obliquely to the left of the median line

in the middle third of the body. The single, large, globular testis is centrally located in the posterior third of the body. Anterior to the testis, to the right of the median plane, are the roundish ovary and seminal receptacle, the latter occupying an intervening position between the testis and ovary. The greatly distended, Y-shaped excretory tube occupies a blackish semilunar space enclosing the posterior border of the testis in the extreme posterior portion of the body. Spherules from the blackish material filling the excretory tube are continually being discharged from the excretory pore. Anteriorly the expulsor is narrowed into the tubular ejaculatory duct, which, in common with the denticulated metraterm with which it unites, ends right by the smaller pole of a small, richly cellular, pear-shaped body situated obliquely mesially or a little to the right of the median plane, at the junction of the anterior and middle thirds of the body of the trematode, the smaller pole of this pear-shaped body being directed obliquely posteriorly. This pear-shaped body is the anlage of the ventrogenital sac, and it is its smaller pole that must be scrutinized in order to establish the identity of the metacercaria. In *Haplorchis calderoni* the surface of this pole is studded with a few, very minute, rudimentary prickles. The oral sucker is anterosubterminal, the prepharynx short, the pharynx globular, and the œsophagus capillary and bifurcating anterior to the ventrogenital sac into two cæca which extend laterally on either side of the body and end blindly at the level of the posterior border of the testis.

The fresh metacercariæ (cysts) vary in length from 0.189 to 0.27 mm, and in width from 0.142 to 0.206 mm. The hyaline cyst wall is 0.00111 to 0.00222 mm thick. The liberated (excysted) metacercariæ range from 0.285 to 0.569 mm in length and vary in width from 0.142 to 0.27 mm. Transversely the oral sucker measures 0.033 to 0.06 mm; and longitudinally it varies from 0.033 to 0.43 mm. The pharynx is 0.033 mm long and 0.27 mm across. The intestinal cæca vary from 0.083 to 0.1 mm in length. The discs contained in the intestine have a diameter of 0.01665 mm. The ventrogenital sac measures 0.018 by 0.015 mm. The testis has a transverse diameter which varies from 0.06 to 0.093 mm and a longitudinal diameter ranging from 0.047 to 0.06 mm. The length of the expulsor oscillates between 0.057 and 0.08 mm. The eye spots measure 0.005 mm transversely and 0.003 mm longitudinally. One of the cuticular spines on the anterior portion of the larva was

also measured; it had a width of 0.007 mm and a length of 0.005 mm.

THE METACERCARIA OF *HAPLORCHIS SISONI* AFRICA, 1938⁽¹⁾ (PLATE 2,
FIGS. 1 AND 2)

The metacercariæ of this experimental heterophyid⁽¹⁰⁾ recently described by one of us (C. M. A.)⁽¹⁾ parasitize the inter-radial tissue of the caudal fin and the flesh of a fresh-water fish named *Therapon plumbeus* (Kner)², locally known as *ayungin*.

Under the dissecting microscope these metacercariæ are very minute, whitish, ellipsoidal grains easily dissected away from the tissues in which they are found encysted. The cyst membrane is thin and transparent, and the contained larva, which is bent upon itself, moves briskly, and shows a large, blackish, roundish portion standing in high contrast with a smaller, light-colored, semilunar portion. Under the low power of the compound microscope the black mass is observed to be the excretory vesicle, which is filled with numerous refractile spherules and hides from view the other organs contained in the posterior half of the bent larva. The lighter-colored, semilunar portion is the anterior half of the parasite, which shows well the cuticular spines, the oral sucker, prepharynx, pharynx, œsophagus, and part of the intestinal cæca. The cyst fluid contains conspicuous, oval, translucent, thin bodies of uniform size, which are discharged from the alimentary canal through the oral sucker. In the digestive tract of the larva these bodies are discoidal and apparently slightly compressible, and align themselves in a single rouleau which completely fills the lumen of the tract. Rhythmical contractions of the digestive tube shove them out into the cyst cavity, where they take on an oval outline. When the cyst wall breaks, the discs resume the circular outline and manifest a tendency to cupping, in much the same fashion as erythrocytes do. Ciurea (5, pp. 68, 74, 80) has observed similar discs in the intestinal cæca of the metacercariæ of *Pygidiopsis genata*, *Metascocotyle witenbergi* [= *Parascocotyle* (Ransom)] and *Ascocotyle cælostoma*, and states that he does not know what they mean. We find ourselves in the same predicament. With regard to the spherules contained in the excretory vesicle Ciurea⁽⁵⁾ writes that they are made up of calcium carbonate.

² Due to an error this fish was noted down as *Therapon argenteus* in the above-mentioned description of *Haplorchis sisoni* (C. M. A.). ⁽¹⁾

The cysts are indistinguishable from those of the metacercariæ of *Haplorchis calderoni*, and it is only after excystment that the larvæ may be identified. They are spontaneously liberated under the slight pressure exerted by a thin cover glass upon them. The excysted pyriform larva moves actively and shows numerous, scalelike, cuticular spines arranged in quincunx, which gradually become less and less conspicuous and finally disappear towards the posterior end of the parasite. The organs contained in the posterior half of the larva are pushed anteriorly by the greatly distended excretory vesicle forming a large, black, semilunar pouch filled with spherules and occupying the posterior fourth of the body of the trematode, where it encroaches upon the testis and partly hides it from view. In this state of distention of the excretory vesicle the ventrogenital sac occupies the center of the body of the worm. It is a transversely ovoid organ, bearing at its smaller pole a very tiny, planoconvex, prickly appendage, the gonotyl, thickly set with very minute, conical spines on its free, convex surface, and attached sessile by its plane surface to the sustaining, ovoid structure just mentioned. In the adult experimental heterophyid recovered from animals fed with this metacercaria, the ventrogenital sac is a thick-walled, saclike organ placed deeply in the body, opening on the ventral surface, and bearing at its brim the tiny, prickly appendage, the gonotyl, described above. A conspicuous, pyriform muscular expulsor, showing longitudinal striations enclosed within a thick, hyaline wall, tapers anteriorly and mesially into a narrow ejaculatory tube that, uniting with the tubular anlage of the metraterm, forms the common genital duct and ends underneath the prickly armature of the gonotyl. It resembles the expulsor of *Haplorchis calderoni*, but is much smaller. Like it, it follows the curve of the left intestine and occupies a position between the latter and the ovary. The metraterm, like that of *Haplorchis calderoni*, shows denticulations on its inner surface. The round ovary occupies a position between the expulsor on the left and the intestinal ramus on the right, with the mesially placed, single, spherical testis posterior to it, and the ventrogenital sac anterior. The anlage of the seminal receptacle is sometimes discernible as a tiny, delicate, roundish structure on the right side of the body between the ovary and testis. The digestive tract has its origin in an anterosubterminally placed oral sucker giving rise to a short prepharynx that leads into a thick pharynx, from which arises

a filiform œsophagus which, anterior to the ventrogenital sac, bifurcates into two cæca that, proceeding laterally and posteriorly, end blindly not farther than the middle transverse level of the testis. Within the intestinal cæca and œsophagus are contained the conspicuous, transparent discs mentioned above, closely packed at some points or only overlapping at others, like a series of coins in a single rouleau filling the lumen of the gut. As stated above in the course of this description, these discs are apparently compressible, for, when closely packed, they seem to be slightly thinner than when loosely packed. They are discharged at intervals through the oral sucker, and seem to be quite elastic and resistant. We have never observed them to break up.

The metacercariæ (cysts) range from 0.174 to 0.299 mm in length, and from 0.107 to 0.192 mm in width. The cyst wall, which consists of a hyaline substance, varies from 0.00111 to 0.00296 mm. The discs contained in the digestive tract range from 0.01332 to 0.01832 mm in diameter, and have a thickness of 0.00333 mm. Those observed by Ciurea(5) in the metacercariæ of *Pygidiopsis genata* varied from 0.013 to 0.017 mm in diameter, with a thickness of 0.004 mm. The excysted metacercariæ (quiescent) vary from 0.342 to 0.614 mm in length, and from 0.16 to 0.242 mm in width. The oral sucker measures 0.044 to 0.058 mm longitudinally, and 0.053 to 0.055 mm transversely. The prepharynx is 0.03 mm long and 0.003 mm wide. The pharynx measures 0.031 mm transversely and 0.028 to 0.03 mm longitudinally. The œsophagus is 0.121 mm long. The ventrogenital sac, exclusive of the gonotyl, has a transverse diameter of 0.025 mm and a longitudinal diameter of 0.019 mm. The gonotyl ranges from 0.009 to 0.010 mm in diameter. The expulsor has a length of 0.05 to 0.074 mm, and in width varies from 0.024 to 0.025 mm, its hyaline, nonstriated, external layer having a thickness of 0.003 mm. The ejaculatory duct is 0.03 mm long and 0.003 to 0.006 mm across.

THE METACERCARIA OF HAPLORCHIS YOKOGAWAI (KATSUTA, 1332) (7)
(PLATE 2, FIGS. 3 AND 4)

From the results of feeding experiments(9,10) we know that *Hemiramphus georgi* Cuvier and Valenciennes, *Ambassis buruensis* Bleeker, *Mugil dussumieri* Cuvier and Valenciennes, *Clarias batrachus* (Linnæus), *Arius manillensis* Cuvier and Valenciennes, *Ophicephalus striatus* Bloch, and *Gerris kapas* Bleeker are piscine intermediate hosts of *Haplorchis yokogawai*. For

the study of the metacercariæ of this trematode material was obtained from the flesh of *Arius manillensis*, in which they are often found in great numbers.

Under the dissecting microscope the metacercariæ make their appearance on the bottom of the dissecting dish, where the flesh of the fish is being teased out, as tiny, ellipsoidal, grayish bodies completely filled up by an actively moving, coiled up, light-brownish larva. They are apparently very loosely attached to the muscle tissue, for, when first sighted, they have already gained the bottom of the dissecting dish. They evidently drop from the tissues with the greatest facility. To the naked eye they are indistinguishable from the flesh of the fish, but isolated, the metacercaria is visible as a very minute whitish grain. An idea of its abundance in the flesh of this fish is furnished by the following observation: from a block of its flesh measuring only 3.87 cc, 57 metacercariæ of *Haplorchis yokogawai* and 5 of another species were obtained. Under low power the round, blackish mass formed by the distended excretory tube stands out in contrast with the light-brownish coloration of the rest of the larva's body, the worm being flexed upon itself ventrally and almost, or quite, completely filling up the cyst cavity, wherein it whirls more or less actively. Its cuticle is covered with spines, and highly refractive, yellowish-greenish droplets discharged from the excretory tube surround the worm. By high power, at a point anterior to, and close by, the black mass formed by the excretory tube, is clearly seen the typical gonotyl of *Haplorchis yokogawai* garnished with tiny spines and two conspicuous plates, quite as described by Chen(4) for the adult. Even metacercariæ so young as to still exhibit the eye spots show the characteristic gonotyl plates in the center of the body of the young trematode posterior to the eye spots. The cyst wall is made up of a thin layer of a hyaline substance, which, under gentle pressure, ruptures and allows the contained larva to escape. The excysted worm is oblong or pyriform, and scalelike spines arranged in quinquex cover its body, except at the posterior pole, while scattered throughout in its tissue, especially around the oesophagus and its bifurcation, are seen pigment granules. The oral sucker is anterosubterminal, the pharynx globular, and the oesophagus, which is about twice as long as the prepharynx, bifurcates at the middle of the body into two cæca, each of which, running laterally, gradually widens out, and comes to a blind end beyond the posterior border of the testis, on either side of the more or less distended excretory tube, the two cæca

enclosing together with the latter the conspicuous ventrogenital complex situated obliquely behind the bifurcation of the œsophagus and the receptaculum seminis, the ovary, and the single testis grouped behind it, the ovary and receptaculum seminis occupying an intervening position between the ventrogenital complex and the testis. The cæca are closely packed with discs not unlike those found in other metacercariæ and described elsewhere in this paper. The ventrogenital complex comprises two portions; one, a larger, colorless, more or less globular, non-spiny body; and the other, a smaller, spiny, more or less heart-shaped structure, which, as a shield, overlaps the mesial pole of the nonspiny, globular integument. The spiny portion, the gonotyl, is occupied by two very conspicuous, chitinous, more or less serrated plates, which are surrounded by numerous, very minute spines, or prickles, the plates taking a more or less eccentric position in this clearly delimited, spiny constituent. The plates are 0.00592 to 0.00814 mm long and 0.00222 to 0.00296 mm wide, and, at their very root, where they are inserted side by side into the body tissue, they are only 0.00148 mm apart. They are chitinous, concave structures with irregularly serrated, incurving edges, the concavity being directed ventrad. Not infrequently one of the plates is actually made up of several curved pieces. The plates occupy an area of 0.0088 mm in diameter, the total area covered by them and the surrounding minute spines, the gonotyl, measuring 0.01776 by 0.02368 mm. The transverse diameter of the ventrogenital complex is 0.04462 mm long and its longitudinal diameter 0.0333 mm long. The organ is located at the junction of the middle and posterior thirds of the body. The testis measures 0.04995 mm transversely and 0.03663 mm longitudinally, and the ovary is 0.02331 and 0.02664 mm in the same, respective, directions. The receptaculum seminis is about the size of the ovary. The intestinal cæca measure 0.173 mm in length, their width at the œsophageal bifurcation being 0.0066 mm and at the posterior end, 0.01332 mm. The œsophagus measures 0.08658 by 0.00666 mm, the pharynx 0.04329 by 0.03663 mm, the prepharynx is 0.0333 mm long, and the oral sucker 0.0666 and 0.07326 mm in its longitudinal and transverse diameters, respectively. The excysted larva is 0.427 mm long and 0.185 mm wide. The cysts vary from 0.142 to 0.277 mm in length, and from 0.114 to 0.249 mm in width. The cyst wall has a thickness of 0.000832 to 0.001385 mm.

THE METACERCARIA OF *STELLANTCHASMUS FALCATUS* ONJI AND NISHIO, 1924
(= *DIORCHITREMA PSEUDOCIRRATA*) (PLATE 2, FIGS. 5 AND 6)

Diorchitrema pseudocirrata Witenberg, 1929 (11) is, according to Alicata and Schattenburg, (3) synonymous with *Stellantchasmus falcatus* Onji and Nishio, 1924. Doctor Alicata saw our material and compared it with his specimens of *Stellantchasmus falcatus*, which he recovered from a Japanese in Hawaii, and he declared that the two materials are identical. Doctor Price, of the Bureau of Animal Industry, Washington, D. C., who also saw our specimens, holds the same opinion. By right of priority *Stellantchasmus falcatus* should be the valid name of this species.

By feeding experiments (9, 10) we have found that *Mugil dussumieri* Cuvier and Valenciennes and *Anabas testudineus* (Bloch) are piscine intermediate hosts of *Stellantchasmus falcatus*. Dissections of the entire body of *Mugil dussumieri* have revealed that the metacercariæ parasitize the flesh and the body cavity (in the vicinity of the heart) of this fish. The cysts are only loosely attached to the flesh, and to the naked eye they appear as very tiny whitish grains. Under the dissecting microscope the ellipsoidal, transparent cyst shows a minute, oblong, actively whirling, light-brownish larva which is covered with small cuticular spines and is slightly bent upon its ventral aspect, almost completely filling the cyst cavity. Under the low power of the compound microscope it is easily recognized by the obliquely placed, more or less elongated, pyriform expulsor situated alongside the curve of the left intestine, the round ovary opposite to the expulsor, and the two globular testes behind them, one on either side and on the same transverse level, in the posterior portion of the body. Blackish liquid rich in spherules fills the distended and conspicuous excretory tube between the testes, and is discharged from the excretory pore into the fluid of the cyst cavity. Under high power the expulsor shows spiral fibers enclosed within a thick, transparent wall. Anteriorly it narrows into a short ejaculatory duct which leads into a transparent, globular structure, the ventrogenital sac, situated behind the bifurcation of the œsophagus, lateral to the mesial plane, on the opposite side at the junction of the middle and posterior thirds of the body. Within this globular structure is clearly visible the ventral sucker apposed to an external aperture which is surrounded by very minute, rudimentary, hairlike spines, the whole structure describing a conspicuous, horseshoe-shaped figure. Neither in these metacercariæ nor in their expe-

rimentally recovered adults have we been able to detect the mass of prostatic cells described by Witenberg as surrounding the junction of the uterus and ejaculatory duct in specimens of *Diorchitrema pseudocirrata*. Connecting with the posterior end of the expulsor by a constriction is a more or less globular structure, the first portion of the seminal vesicle. The oral sucker is situated anterosubterminally, the prepharynx is short, and the pharynx is more or less globular. The œsophagus, about twice as long as the prepharynx, bifurcates in the middle portion of the body into two cæca which run laterally on either side and end blindly at the anterior border of the testis. Discs like those seen in the digestive tube of *Haplorchis calderoni* and *Haplorchis sisoni* metacercariæ fill up the intestinal cæca. The arms of the excretory tube are continued anteriorly on either side of the body as blackish, fine, tortuous tubes extending up to the oral sucker.

The metacercariæ (cysts) range from 0.135 to 0.142 mm in length, and from 0.133 to 0.391 mm in width. The cyst wall varies from 0.0016 to 0.0022 mm. The excysted metacercaria, when quiescent, is 0.583 to 0.598 mm long and 0.171 to 0.299 mm across. The oral sucker measures 0.0725 mm transversely and 0.0636 mm longitudinally. The prepharynx is 0.0013 mm long. The pharynx measures 0.004 mm longitudinally and 0.0039 mm transversely. The œsophagus has a length of 0.085 mm.

THE METACERCARIA OF *STAMNOSOMA FORMOSANUM* NISHIGORI, 1924⁽⁸⁾
(PLATE 2, FIGS. 7 AND 8)

In our first paper on the determination of the piscine intermediate hosts of Philippine heterophyid trematodes by feeding experiments⁽⁹⁾ we made the following remarks in connection with Centrocestinæ:

In one of the species of fish (*Ambassis buruensis*) utilized in these experiments we have frequently found two apparently different species of *Stamnosoma* (one big and having a long intestine, and the other very tiny and having a short intestine).....in their metacercarial stage. The larger of the two *Stamnosoma* metacercariæ also parasitizes *Hepsetia balabacensis*, another fish used in these experiments. Up to this time, however, we have consistently failed to recover these Centrocestinæ by experimental feeding to albino rats and mice, kittens, and puppies. One of us (C. M. A.) recovered an apparently new species of *Stamnosoma* from the intestine of a pelican (*Pyreroides manilensis*) and from the cattle egret.

In the succeeding progress report⁽¹⁰⁾ we reported, among other findings, on the experimental recovery of *Stamnosoma formosa-*

num by means of feeding experiments, involving four species of fish; namely, *Ophicephalus striatus* Bloch, *Glossogobius giurus* Buchanan-Hamilton, *Therapon plumbeus* (Kner), and *Anabas testudineus* (Bloch), which we demonstrated to be intermediate hosts of the parasite. And we remarked that this species of *Stamnosoma* was not identical with either of the two species the metacercariæ of which we had found in dissections of *Ambassis buruensis*. By actual dissections we have verified the presence of the metacercaria of *Stamnosoma formosanum* in the gills of *Therapon plumbeus* (Kner), mentioned above, as well as in those of another species of fish, namely, *Hemiramphus dussumieri* Cuvier and Valenciennes.

The metacercariæ are found in the fibrils of the gills and also in the soft tissues between the gill arches as tiny, ellipsoidal cysts which, under low power, show a grotesque-looking, actively turning larva. The cyst wall is thin, a fraction or more of a micron in thickness, but the tissue immediately surrounding the cyst (in the gill fibrils) is apparently compressed from pressure exerted by the developing larva, and forms a sort of a fibrous capsule around it which varies from 0.0025 to 0.005 mm in thickness. The actively moving worm shows a conspicuous, blackish, excretory tube which assumes bizarre shapes—from that of a Y resting on a base line, to N, Z, and other odd and capricious patterns—a feature which, as well as the more or less circular ventral sucker and the double row of 34 alternating, circumoral spines, at once engages the attention of the examiner. Gentle tapping of the cover glass overlying the cysts under examination suffices to cause the larva to excyst. In the extended, bottle-shaped, excysted trematode the anlage of the various organs integrating the adult can be distinctly made out. Anteriorly the oral sucker is prominent, with its double row of spines reminiscent of phonograph needles. It is subterminally placed, and from it arises a long prepharynx which is about three times as long as the œsophagus. The pharynx is squarish in outline, and the short œsophagus bifurcates at the junction of the anterior and middle thirds of the body into two rami, each of which courses laterally, following the curve of the body sides and gradually widening as it proceeds to end in a cul-de-sac a little beyond the level of the anterior border of the ovary, the two rami enclosing the circular ventral sucker situated at the junction of the middle and posterior thirds of the body, while their rounded-off,

blind ends partly enclose also the anlage of the ovary and receptaculum seminis, the latter being somewhat overlapped by the former. Side by side, on the same level, in the extreme posterior portion of the body, and separated from each other only by the Y-shaped excretory tube, are the two transversely ovoid, smooth testes. Within the intestine bright, transparent discs move up and down rhythmically.

In size the cysts range from 0.149 to 0.228 mm longitudinally, and from 0.1 to 0.142 mm transversely, while the excysted larvæ vary in length from 0.455 to 0.47 mm, and in width average 0.114 to 0.135 mm.

INCIDENCE, SITE, AND DEGREE OF METACERCARIAL INFECTION IN THREE SPECIES OF MARINE FISH

As stated in the introductory remarks, the three marine species of fish selected for this study were the following: *Hepsetia balabacensis* Jordan and Hubbs, *Hemiramphus georgi* Cuvier and Valenciennes, and *Ambassis buruensis* Bleeker. They were all small fish, the *Hepsetia* and the *Ambassis* ranging around 7 cm in length, and *Hemiramphus georgi* from 10 to 12 cm.

TABLE 1.—Incidence of metacercarial infection in *Hepsetia balabacensis*, *Ambassis buruensis*, and *Hemiramphus georgi*.

Name of fish dissected.	Number of fish dissected.	Number of fish positive for metacercariæ.	Incidence of infection.	Period of dissection.
			<i>Per cent.</i>	1937
<i>Hepsetia balabacensis</i>	416	169	40.625	April 3 to June 5.
<i>Ambassis buruensis</i>	414	228	55.073	March 30 to May 27.
<i>Hemiramphus georgi</i>	91	65	71.429	Do.

TABLE 2.—Degree of metacercarial infection in *Hepsetia balabacensis*, *Ambassis buruensis*, and *Hemiramphus georgi*.

Name of fish dissected.	Number of fish positive for metacercariæ dissected.	Minimum number of metacercariæ per fish.	Maximum number of metacercariæ per fish.	Average number of metacercariæ per fish.	Period of dissection.
					1937
<i>Hepsetia balabacensis</i> ...	76	1	302	22.94	May 7 to 27.
<i>Ambassis buruensis</i>	138	1	141	23.347	March 1 to May 27.
<i>Hemiramphus georgi</i>	27	1	2,008	226.4	March 4 to May 24.

TABLE 3.—Order of frequency of metacercarial infection in various sites of body of *Hepsetia balabacensis*, *Ambassis buruensis*, and *Hemiramphus georgi*.

Name of fish dissected.	Number of positive fish dissected.	Number and percentage of fish showing metacercariae in various sites singly or simultaneously infected as grouped below:									
		Caudal fin only.		Flesh only.		Abdominal cavity only.		All fins simultaneously.		Caudal fin and flesh simultaneously.	
		No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.
		No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.
<i>Hepsetia balabacensis</i>	49	1	2.04	8	16.33	13	26.53	0	0	1	2.04
<i>Ambassis buruensis</i>	59	0	0	2	3.39	48	81.36	1	1.69	0	0
<i>Hemiramphus georgi</i>	43	0	0	2	4.65	31	72.09	0	0	1	2.33
Number and percentage of fish showing metacercariae in various sites singly or simultaneously infected as grouped below:											
Name of fish dissected.	Caudal fin and abdominal cavity simultaneously.	Flesh and abdominal cavity simultaneously.		Caudal fin (total).		All fins (total).		Flesh (total).		Abdominal cavity (total).	
		No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.
		No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.
		No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.
<i>Hepsetia balabacensis</i>	0	0	0	22	44.89	6	12.24	0	0	35	71.43
<i>Ambassis buruensis</i>	0	0	0	8	13.56	1	1.69	10	16.95	57	96.61
<i>Hemiramphus georgi</i>	2	4.65	0	7	16.28	3	6.98	0	0	10	23.26
											Period of dissection.
											1937
											January 22 to April 8 (20 days).
											January 25 to April 8 (24 days).
											January 26 to May 2 (19 days).

NOTE.—In this tabulation the gills have been included under the designation "Abdominal cavity." Only *Ambassis buruensis* in this series of dissections showed metacercariae in the gills.

Under a dissecting microscope they were teased out to the finest particle, no nook, no corner, no bit, escaping the teasing needle and the scrutinizing eye, so that at the end of the dissection the fish had been reduced to powder, practically speaking, so thorough had been the carding to which it had been subjected. In the flesh the metacercariæ are found in greatest number in the posterior portion of the body. In the abdominal cavity they are free, or more or less loosely attached to the viscera. In the gills they lodge in the fibrils. In the fins they attack the interradiial web. The various sites occupied by the metacercariæ of *Stictodora guerreroi*, *Stictodora manilensis*, and *Haplorchis calderoni*, in so far as they concern these three fish, have been mentioned elsewhere in this paper, in the corresponding descriptions of these larval trematodes. Our dissections in pursuance of this survey extended over a period of six months, from January to June, 1937. For convenience, we give our findings in tabulated form. Table 1 shows the incidence of metacercarial infection in the three species studied; Table 2, the degree of this infection; and Table 3 indicates the sites of the fish's body infected by the metacercariæ, as well as the order of frequency of metacercarial infection in these sites. Table 4 gives the measurements of the various metacercariæ studied. The tables are self-explanatory.

REMARKS

The studies embodied in this report are complementary to the results of our feeding experiments (9, 10) for the determination of the piscine intermediate hosts of Philippine heterophyids, verifying, on the one hand, the identity of various species experimentally recovered, and furnishing, on the other, statistical data on the incidence, site, and degree of metacercarial infection in three species of marine fish, data which they supplement with information regarding the precise localization of the various heterophyid metacercariæ described.

Although, as stated by us in the introductory remarks, it is possible, by identifying the metacercariæ alone in a given fish, to determine the species of trematodes of which it is the second intermediate host, the amount of material, work, and time which this method entails in species which are found only occasionally, and in scanty numbers at that, is obvious, and, as far as we are concerned, actually familiar to us.

TABLE 4.—Measurements of the various metacercariæ studied in this report.

Name of metacercaria.	Name of fish.	Average size of encysted metacercaria from:—			
		Gills.	Cauda lfn.	Flesh.	Abdominal cavity.
		mm.	mm.	mm.	mm.
<i>Sticlodora guerrieri</i>	<i>Hepsetia balabacensis</i>	-----	0.27 X 0.192	0.277 X 0.171	0.417 X 0.329
Do.....	<i>Ambassis buruensis</i>	-----	-----	-----	0.530 X 0.4669
Do.....	<i>Hemiramphus georgi</i>	-----	-----	-----	0.435 X 0.364
<i>Sticlodora mantlensis</i>	<i>Ambassis buruensis</i>	-----	0.213 X 0.147	-----	0.379 X 0.331
Do.....	<i>Mugil dassumieri</i>	-----	-----	0.2869 X 0.230	0.371 X 0.327
Do.....	<i>Gerris filamentosus</i>	-----	-----	-----	0.306 X 0.270
Do.....	<i>Hepsetia balabacensis</i>	-----	0.227 X 0.199	0.265 X 0.1689	-----
<i>Haplorchis calderoni</i>	<i>Hepsetia balabacensis</i>	-----	-----	0.1885 X 0.1423	-----
Do.....	<i>Anabas testudineus</i>	-----	-----	0.2276 X 0.1707	-----
Do.....	<i>Creisson validus</i>	0.224 X 0.171	-----	0.2276 X 0.1802	-----
<i>Haplorchis sioni</i>	<i>Therapon plumbeus</i>	-----	0.2419 X 0.1636	0.2274 X 0.1496	-----
<i>Haplorchis yokogawai</i>	<i>Artus mantlensis</i>	-----	-----	0.1806 X 0.1465	-----
<i>Stellantichasmus faleatus</i>	<i>Mugil dassumieri</i>	-----	-----	0.2242 X 0.1874	-----
<i>Stennoacma formosum</i>	<i>Therapon plumbeus</i>	0.1849 X 0.117	-----	-----	-----
Do.....	<i>Hemiramphus dassumieri</i>	0.1707 X 0.1188	-----	-----	-----

Name of metacercaria.	Name of fish.	Average size of excysted metacercaria, mm.	Thickness of cyst wall, mm.	General average size of the excysted metacercariae, hosts and sites combined, mm.	General average size of the excysted metacercariae, hosts and sites combined, mm.
<i>Stictodora guerreroi</i>	<i>Hepsetia balabacensis</i>	1.1739×0.249	-----	-----	-----
Do.....	<i>Ambasis buruensis</i>	0.7257×0.213	-----	-----	-----
Do.....	<i>Hemiramphus georgi</i>	-----	0.0027	0.4144×0.3416	0.9498×0.2312
<i>Stictodora manillensis</i>	<i>Ambasis buruensis</i>	-----	-----	-----	-----
Do.....	<i>Mugil dussumieri</i>	0.7968×0.3415	-----	-----	-----
Do.....	<i>Gerris filamentosus</i>	-----	-----	-----	-----
Do.....	<i>Hepsetia balabacensis</i>	-----	0.00257	0.3435×0.2894	0.797×0.342
<i>Haplorchis calderoni</i>	<i>Hepsetia balabacensis</i>	0.3666×0.1814	-----	-----	-----
Do.....	<i>Anabas testudineus</i>	0.5692×0.2703	-----	-----	-----
Do.....	<i>Creisson validus</i>	0.313×0.166	0.001665	0.224×0.175	0.3736×0.1885
<i>Haplorchis stioni</i>	<i>Therapon plumbeus</i>	0.4109×0.1878	0.001744	0.228×0.151	0.4109×0.1878
<i>Haplorchis yokogawai</i>	<i>Arius manillensis</i>	0.4269×0.1849	0.001178	-----	-----
<i>Stellantiasmus falcatus</i>	<i>Mugil dussumieri</i>	0.5905×0.2347	0.001932	-----	-----
<i>Stamnosoma formosanum</i>	<i>Therapon plumbeus</i>	0.4648×0.128	-----	-----	-----
Do.....	<i>Hemiramphus dussumieri</i>	0.4624×0.128	-----	0.1835×0.1166	0.4642×0.128

NOTE.—All measurements in this table are based on the study of fresh material.

Finally, we wish to state that we made no serious effort to trace out the excretory system of these heterophyids, beyond noting the presence of the excretory canals and flame cells, and their general arrangement in some of the metacercariæ here studied, because our main object in view was simply the identification of the metacercariæ.

SUMMARY AND CONCLUSIONS

1. Descriptions based on original morphological studies of Philippine material are herein given of the metacercariæ of *Stictodora guerreroi*, *Stictodora manilensis*, *Haplorchis calderoni*, *Haplorchis sisoni*, *Haplorchis yokogawai*, *Stellantchasmus falcatus* Onji and Nishio (= *Diorchitrema pseudocirrata*) and *Stamnosoma formosanum*.

2. Statistical data, based on actual dissection of hundreds of fish bought at random from the various markets of Manila, are herein presented on the incidence, site, and degree of metacercarial infection in three species of marine fish; namely, *Hepsetia balabacensis* Jordan and Hubbs, *Ambassis buruensis* Bleeker, and *Hemiramphus georgi* Cuvier and Valenciennes.

3. Direct evidence is furnished of the richness of Philippine fishes, marine and fresh-water, in heterophyid metacercariæ.

4. These morphological studies show that, at least in the case of the majority of heterophyids studied, identification of the metacercariæ in the fish host suffices to determine the species of heterophyids of which it is the second intermediate host. In the course of our dissections we have observed this to be true also of some nonheterophyids.

5. These studies are complementary to the results of our feeding experiments for the determination of the piscine intermediate hosts of Philippine heterophyid trematodes. (9, 10)

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ILLUSTRATIONS

[Microdrawings of metacercariæ before and after liberation from their cysts.]

PLATE 1

- FIG. 1. Metacercaria of *Stictodora guerreroi* (encysted).
2. Metacercaria of *Stictodora guerreroi* (liberated).
3. Metacercaria of *Stictodora manilensis* (encysted).
4. Metacercaria of *Stictodora manilensis* (liberated).
5. Metacercaria of *Haplorchis calderoni* (encysted).
6. Metacercaria of *Haplorchis calderoni* (liberated).

PLATE 2

- FIG. 1. Metacercaria of *Haplorchis sisoni* (encysted).
2. Metacercaria of *Haplorchis sisoni* (liberated).
3. Metacercaria of *Haplorchis yokogawai* (encysted).
4. Metacercaria of *Haplorchis yokogawai* (liberated).
5. Metacercaria of *Stellantchasmus falcatus* (encysted).
6. Metacercaria of *Stellantchasmus falcatus* (liberated).
7. Metacercaria of *Stamnosoma formosanum* (encysted).
8. Metacercaria of *Stamnosoma formosanum* (liberated).

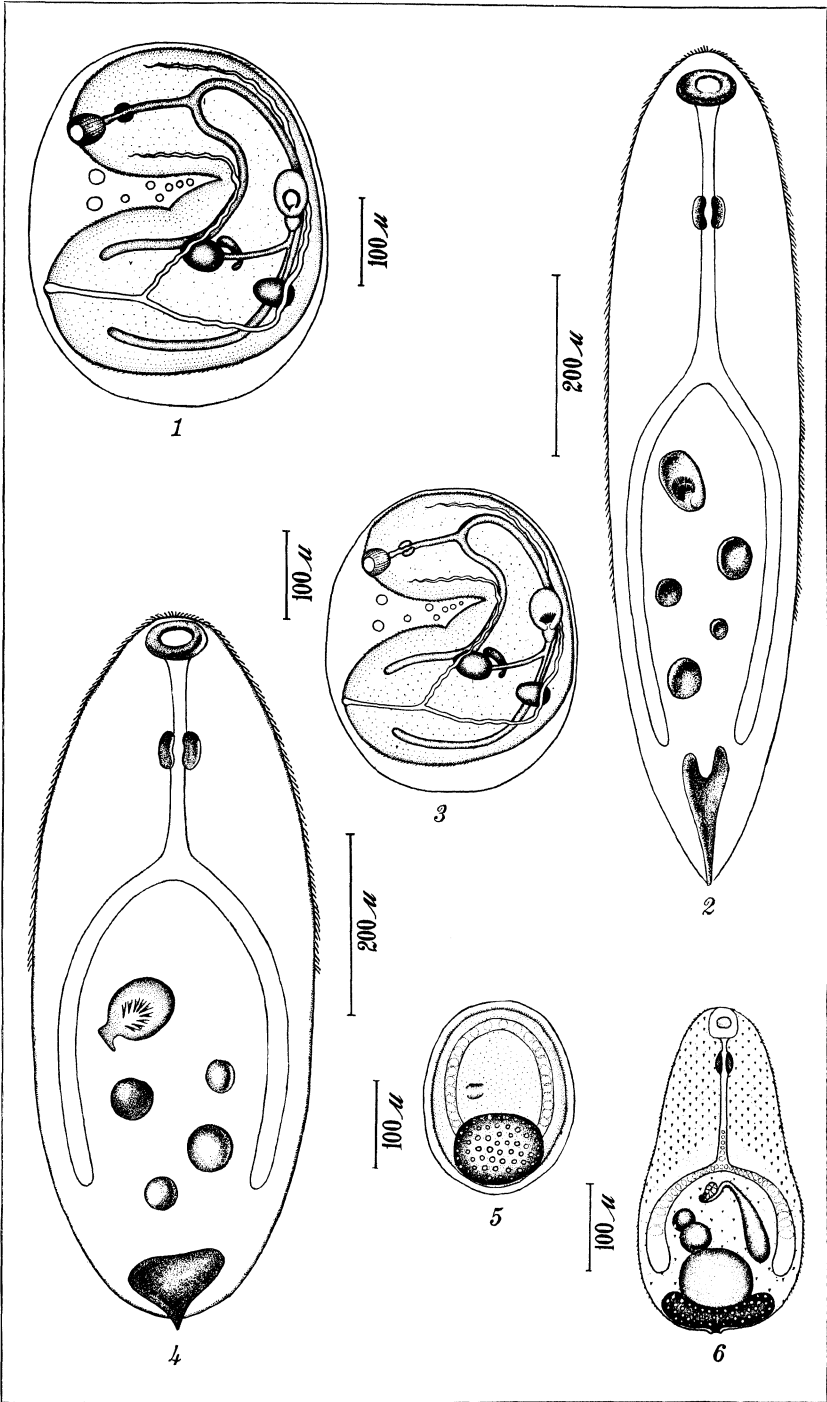


PLATE 1.

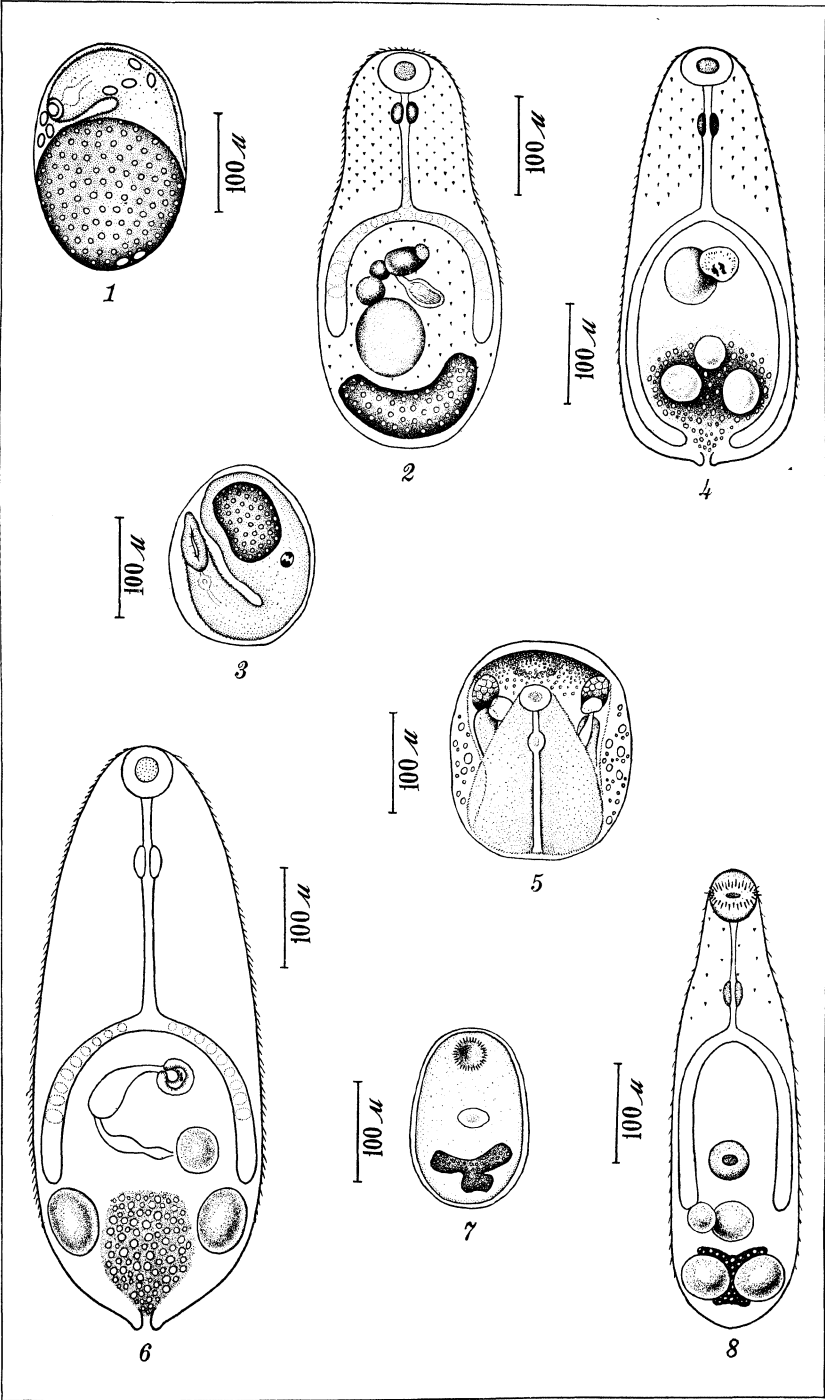


PLATE 2.

THE VERBAL PREFIXES *MAÑĠ* AND *MA* AND DEFECTIVE VERBS IN ILOKO

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I. THE TRANSITIVE PREFIX *MAÑĠ*

When a verb usually substantival has to be used in the adjectival construction for some reason or other, and has to remain transitive at the same time, the adjectival prefix *mañĠ* (past: *nañĠ*) is joined to the verb as it is, its prefixes remaining; its suffixes, however, are dropped.

All the forms of the prefix *mañĠ* which have been studied in preceding papers are of use here.¹

Here follow the most important forms:

1. The suffixes *en* and *an* are changed into the prefix *mañĠ*.
Examples:

asin ti mañġála iti asin?
siák ti nañġáwis iti ubiñġ.
dakamí ti nañġarámid.
datayó ti mañġúray kenkuána.
dakamí ti nanáit iti bádoná.
asin ti mañġdúsa iti anákko.
dagiti gayyémmi ti mañġdáwat.
siák ti mañġsaplit.
dagitoy ti nañġtúlad.
isúda ti manĩñġir.
dagiti kaaróbami ti nanúluy.
awán ti nanuñġpál.
awán ti mamáti.
dakamí ti nañġpátit.
asin ti namarsuá iti líboñġ?
siák ti mañġpilit kenká.
datayó ti mamonpón.
siák ti mañġuddót.
asin ti mañġbáut?
mamisibiskayo kadagiti mǔla.

who takes the salt?
I coaxed the child.
we made it.
we should wait for him.
we sewed his coat.
who punishes my child?
our friends ask it.
I shall whip him.
these imitated it.
they ask for the payment.
our neighbors continued it.
nobody complied with it.
nobody believes it.
we rang the bells.
who created the world?
I force you.
we should bury him.
I shall nip him.
who whips him?
water the plants.

¹ Notes on Iloko. *Anthropos* 33 (1928) 1037, 1038.

siká ti mamágay ití tálonko.

*siák ti mañgágas kenká.
asin ti nañgálad ití paraáñgan?
dakamí ti nañgatép ití simbáan.
siká ti mañgdalús kadagití ladáwan.
asin ti nanubálit ití súraterna?
awán ti nañgtúlóng kenkuána.
isú ti namalúbos kenká.
awán ti mañgaási kaniák.
isúda ti nañgimbág ití dákes.
awán ti mañgapó kaniák.
awán ti mañgsapín itá lúpot.*

*mañginanamakami kenkuána.
mamúnagkayo ití bató.
asin ti mamisos itóy pirákko?*

*siák ti mañgasín ití kárne.
awán ti nañgraép.
dakayó ti nañglukát kenkuána.
isúda ti nañgtúlóng.
addá nañgcyáb.
dakamí ti nañgnáyon.
siák ti mañgkartib.
addá pañgúgasmó?*

*pañgaásim.
kitáem ti pinanutuókda kenkuána.
aniá ti pinañgságadda ití agdán?
aniá ti pañgsatsátko itóy bádo?
isú ti pinañgtipédá ití yaáyana.*

*awán ti panáit.
aniá ti pañgpisik?
saludsúdenda kenkuána a pañgsu-
súot.*

*aniá ti pañgbáutko ití ubíng?
awán ti pamáyadmi ití útañgmi.*

*daytóy ti pinamárutko.
aláem ti pañgdúsam kenkuána.*

*isúda ti manañginúm ití árak.
isúda ti mananákaw.
mammartékda.
dagití mannálon.
awán ti pañggatáñganmi.
ni daytóy ti nañgsurátanda.
sadín ti panutuókanda kenkuána?
aniá ti pamusipúsanna?*

you should plant rice in my rice field.

I shall give you medicine.
who fenced the yard?
we roofed the church.
you should clean the pictures.
who answered his letter?
nobody helped him.
he let you go.
nobody has mercy on me.
they considered the bad as good.
nobody considers me as his master.
nobody makes that cloth into trousers.

we hope in him.
carry stones.
who will make this money of mine a peso?

I shall salt the meat.
nobody transplanted the rice.
you opened the door for him.
they helped him.
somebody called you.
we augmented it.
I shall cut off a part.
have you something with which to wash them?

please.
look with what they tortured him.
with what did they sweep the stairs?
with what shall I rip this coat?
that is with which they impeded his coming.

there is no thread.
with what shall I split it?
they question him to try him.

with what shall I whip the child?
we have nothing with which to pay our debts.

I pulled it with this.
take something with which to punish him.

they always drink wine.
they are the thieves.
they are drunkards.
the peasants.
we have no place to buy it.
they wrote to this one.
where do they torture him?
why does he turn it?

sadín ti namilitanda kenkuána?
pamiláwan.
panusuótanna kenkuána.
pamalpalíwan.
sadín ti nanñugásanda kadagití piñg-
gán?
asín ti pamatitanda?
sadín ti nanñdaitanna ití bádok?
mabayág ti panañgpátitda.
nalagdá ti pammátida.
kasanó ti panañgálatayo ití daním?
intonanó ti panañgáwistayo ken-
kuána?
kasanó ti panamakawánko?
kasanó ti pannúlada?
kasanó ti pananáitko itóy pandilíng?
napigsá ti panañgbáutna kaniák.
ti pannutúokna.
ti pannaliáwmo.
ti pammilíno.
panañgbaybay-á.
ti saánda a panamáti.
kasanó ti pannúlonñtayo kenkuána?
nalabés ti panañgtutúokda kadakamí.
deñggém ti pananarítana ití napasá-
makna.
kasanó ti pannaóna ití palímed?
napalálo ti panañgsaplítna kadagití
ubbing.
kasanó ti panamagbagák itóy nasú-
beg ñga anákko?

NOTE 1. Complex prefixes derived from the above are: *mañgtagi* or *managi*, *mañgkara* or *mañgara*, *mañgsag* or *manag*, and others. Examples:

dakamí ti mañgtagikuá.
siká ti managidákkes kadagitá.
aniá ti pañgtagisayaátanda itá?

idí kalmán ti panañgtagipaténgmi ka-
dakuáda.
asín ti mañgarasúrat?
siká ti nañgkarapugsát.
awán ti pañgkarakugtáranyo kada-
kuáda.
kasanó ti panañgkarabóonñgmi?
isúda ti nañsaggabassít.
isúda ti managgatló kadagití itédko.
awán ti pañgsagduduánmi ta awán
ti nagyán.
kasanó ti panañgsaggipítómi?
dakamí ti mañgsañgáili.

where did they force him?
 blemish.
 how he tries him.
 a place for observation.
 where did they wash the dishes?

 for whom do they ring the bells?
 where did she saw my coat?
 they ring the bells a long time.
 their faith is strong.
 how shall we draw water?
 when shall we coax him?

 how can I forgive him?
 when did he imitate them?
 how shall I sew this *saya*?
 he whipped me with force.
 his torturing.
 your looking back.
 my order.
 carelessness.
 their unbelief.
 how shall we help him?
 they tortured us exceedingly.
 hear how he relates what happened
 to him.
 how does he tell the secret?
 he whipped the children too much.

 how shall I advise this unruly child
 of mine?

we are the owners.
 you consider those as bad.
 why do they consider that as beau-
 tiful?
 yesterday we considered them as
 precious.
 who writes all the time?
 you broke it continually.
 you have no reason to kick them
 continually.
 how shall we break it continually?
 they did it little by little.
 they take each three of what I give.
 we cannot take two each as it con-
 tains nothing.
 how shall we take seven each?
 we shall be their hosts.

*kasanó ti panaṅgpakinákemko kada-
gitá?*

isúda ti naṅgkaidá kaniák.

how shall I think about those
things?

they lay down with me.

2. The prefix *i* and the combination *i . . . an* are changed into the complex prefix *maṅgi*. Examples:

siák ti naṅgyúlog.

dakamí ti maṅgiláko.

isúda ti maṅgitugkél.

asin ti naṅgibítin?

awán ti maṅgipákat.

maṅgikúyogka ití ubíng.

dakayó ti naṅgidítóy.

maṅgiruárka ití pirák.

asin ti naṅgitaráy?

maṅgikábilda ití bāṅga.

dakamí ti naṅgidáit ití bádonga.

isú ti maṅgisakdó kadagitá.

*awán ti maṅgigátang kaniák ití bá-
dok.*

aldem ti dutdút a paṅgyágasko.

addá pinaṅgigálutko.

ti dágum ti pinaṅgidáitmo.

*daytáy ti pinaṅgimúlak kenká ití
sabá.*

manaṅgibálesda.

manó ti paṅgilakoánna?

sadín ti paṅgimuláantayo?

ti baláymo ti naṅgidulínanna.

awán ti paṅgibilinanna.

siká ti paṅgibatiák.

isúda ti paṅgyawátam.

aniá ti naṅgisalakánanna kadatayó?

siká ti naṅgikariák ití baláy.

ditóy ti paṅgibabaák ití landók.

aniá ti paṅgibayoák kenká?

*idiáy ti naṅgyaramidak ití agá-
maṅna.*

kasanó ti panaṅgiserrétko?

idí kalmán ti panaṅgisublina.

kasanó ti panaṅgyábutko kenká?

kaanó ti panaṅgitúgotna?

*kasanó ti panaṅgibútok kenká ití
inapúy?*

*idí rabíi ti panaṅgigátangko ken-
kuána ití púsa.*

I translated it.

we sell it.

they stick it in.

who suspended it?

nobody harnesses them.

take a child with you.

you put it here.

bring forth money.

who ran away with it?

they place a pot.

we made a coat for him.

she draws water for those.

nobody buys a coat for me.

take a feather for me to apply the
medicine.

I had something to tie it with.

use a needle to sew for her.

this is what I used to plant bananas
for you.

they always take revenge.

what is its price?

where shall we plant them?

he put it in your house.

he has nobody from whom to order
it.

I leave it with you.

give it to them.

why did he save us?

I promised that house to you.

I shall lower the iron here.

why should I pound rice for you?

there I made a granary for him.

how can I put it inside?

he brought it back yesterday.

how can I hand it to you?

when did he take it with him?

how shall I cook rice for you?

last night I bought a cat for him.

NOTE 2. Another complex prefix derived from the above is *mañgika*. Examples:

<i>awán ti mañgikarígat iti bagina.</i>	nobody chastises his body.
<i>kasanó ti panañgikasígudna iti kina-baknáñgna?</i>	how was he rich from the beginning?

3. The prefix *ipa* is changed into the complex prefix *mañgipa*. Examples:

<i>isú ti nañgipapílit.</i>	he insisted.
<i>dagiti mañgipapaárab.</i>	the herdsmen.
<i>mañgipabontókka kadagiti manók.</i>	go with the chickens toward Bontok.
<i>isú ti nañgipasúrong.</i>	he went up the river with them.
<i>awán ti mañgipapuñgán iti bató.</i>	nobody uses a stone for a pillow.
<i>pañgipakaonána.</i>	his prophecy.
<i>aniá ti nañgipaamianánanna?</i>	why did he go northward?
<i>asin ti pañgipaayám?</i>	to whom do you apply it?
<i>sadino ti nañgipabakláyam?</i>	where did you put it on his shoulders?
<i>aniá ti pañgipañgronám iti kastóy?</i>	why do you prefer such a one?
<i>kasanó ti panañgipabúlodko?</i>	how shall I lend it?
<i>idi malém ti panañgipaamítna kaniák iti bagás.</i>	yesterday afternoon he gave me rice to carry.
<i>itáy malém ti panañgipaláudna kadagiti áso.</i>	this afternoon he went westward with the dogs.
<i>kaanó ti panañgipakaammóna kada-kami?</i>	when did he let us know?
<i>kastóy ti panañgipagtéñgna kada-kami iti kayátmi.</i>	this way he gives us what we want.

NOTE 3. The combination *pakin . . . en* is changed into the complex prefix *mañgpakin* or *mamakin*. Examples:

<i>siká ti namakinrabáw.</i>	you put it uppermost.
<i>awán ti mañgpakin-unég.</i>	nobody puts it inside.
<i>awán ti pamakindayáak kenkuána.</i>	I have no place to put it east of (the others).
<i>aniá ti pañgpakinlaúdanna kaniák?</i>	why does he put me west of (the others)?
<i>kasanó ti panañgpakin-amiánanko?</i>	how shall I put it north of (the rest)?
<i>idi bigát kalmán ti panamakinruárda.</i>	yesterday morning they put it outside.
<i>itáy ti pammakinbabámi.</i>	we put it underneath just now.

4. The combinations *pi . . . en* and *pin . . . en*, and the complex prefixes *ipi* and *ipin*, *ikapi*, and *ikapin*, are changed into the complex prefixes *mañgpi* or *mami*, and *mañgpin* or *mamin*,

maṅgipi and *maṅgipin*, *maṅgikapi* and *maṅgikapin*, respectively. Examples:

siák ti maṅgipinlimá.
ti lakáy ti maminpát.
addá naṅgipitló.
aniá ti paṅgipitloám?
sadino ti naminpatánda?
intóno bigát ti panaṅgipinwalómi.
itá ti panaminlimámi.
itáy ti pamminpátda.
ti ubíng ti maṅgipinsiam.
datayó ti naṅgipidudá.
kasanó ti panaṅgipinpátna?
dakamí ti naṅgikapinpitó.
awán ti maṅgikapitló.
ditóy ti naṅgikapinwaloánda.
kaanó ti panaṅgikapin-innémna?
idí kalmán ti panaṅgikapitlók.

I do it five times.
 the old man does it four times.
 somebody did it three times.
 why do you do it three times?
 where did they do it four times?
 to-morrow we shall do it eight times.
 now we do it five times.
 they did it four times just now.
 the child does it nine times.
 we did it twice.
 how shall he do it four times?
 we did it for the seventh time.
 nobody does it a third time.
 here they did it for the eighth time.
 when did he do it for the sixth time?
 yesterday I did it for the third time.

NOTE 4. This form clearly illustrates the composition of the multiplicative numbers. We refer the student to the section on the Number² where the multiplicatives were discussed in detail. It should be noted that the simple prefix *pi* becomes *pin* in this combination (*mamin*) when joined to the number two, *duá*; *piduáen* becomes *maminduá*.

5. The combinations *ka . . . en* and *ka . . . an* are changed into the complex prefix *maṅgka* or *maṅga*, which is rarely used. Examples:

dakamí ti maṅgkaadú.
siák ti maṅgabayág.
awán ti maṅgkapitó.

we augmented it.
 you have it protracted.
 nobody makes it seven.

6. The combination *pag . . . en* is changed into the complex prefix *maṅgpag* or *mamag*. Examples:

asin ti mamagtúbo kadagití mûla?
asin ti namagtaráy ití kabáyó?
siák ti namagtálaw kenkuána.
dakamí ti namagbáliw ití nákemna.
mamaggaráwkami kadagití ubbíng.
isú ti namagári, kenkuána.
ti ímak ti pinamagpusipusko.
aniá ti pamagtaráymo kenkuána?
ti pamagulínek.
ti pinamagsiṅgalút.
ti pamagimbág kadagití tattáo.
isú ti namagsublasublátanna ití pa-
nagkarárag ken panagádalna.

who makes the plants grow?
 who made the horse run?
 I drove him out.
 we made him change his mind.
 we make the children bustle.
 he made him king.
 I turned it with my hand.
 why do you make him run?
 the signal for silence.
 the tie.
 the means to make men good.
 that is why he prayed and studied in turn.

² Anthropos 28 (1933) 715, 716.

<i>sadin ti namagtaláwanda kadakuá-da?</i>	where did they drive them out?
<i>ditóy baláy ti pamagbaútanmi kada-giti kakabsátmi.</i>	we whip our brothers in this house.
<i>kasanó ti panamagtálawda kenkuá-na?</i>	how do they drive him out?
<i>nasayáat ti panamagtúnosna kada-kuáda.</i>	he made them agree nicely.
<i>ti panamagbalinna nga árak iti da-núm.</i>	his changing water into wine.
<i>kaanó ti panamagúñgarna kadagiti natáy?</i>	when did he raise the dead?
<i>idí kalmán ti pammagúgasmí kada-giti ubbíng.</i>	yesterday we made the children wash them.

NOTE 5. Other complex prefixes derived from the above are *mañgpagi* or *mamagi*, *mañgpag.inn* or *mamag.inn*, *mañgpagin* or *mamagin*, and others. Examples:

<i>isú ti mamagisúrat.</i>	he makes him write it.
<i>kasanó ti panamagikárona?</i>	how shall he expiate it?
<i>dakamí ti namagtitinnúloñg kada-kuáda.</i>	we had them help one another.
<i>ditóy ti pamaglinnainñgánda kadagiti agádal.</i>	here they had the students vie in cleverness.
<i>intonanó ti panamagbinnadañgbá-dañgtayo kadagiti kaaróbatayo?</i>	when will we have our neighbors help each other?
<i>ti lakáy ti mamaginpipílay iti ubíng.</i>	the old man makes the child simulate lameness.
<i>aniá ti pamaginkakatawáanyo kada-kuáda?</i>	why do you have them simulate laughter?
<i>manmanó ti pammaginsasáñgitda kadakamí.</i>	they do not often make us simulate weeping.

7. The combinations *pa . . . en* and *pa . . . an*, and the prefix *pa* are changed into the complex prefix *mañgpa* or *mama*. Examples:

<i>aniá ti mamasayáat iti baláy?</i>	what makes the house beautiful?
<i>siák ti mañgpaságad iti silid.</i>	I have the room swept.
<i>asin ti mamaúli kadakuáda?</i>	who brought them in?
<i>siák ti nañgpaála.</i>	I had them taken.
<i>siká ti mamaúlog kadagitá.</i>	you have those brought down.
<i>ni Juan ti mañgpaarámid.</i>	John has it made.
<i>dakamí ti mainám iti báka.</i>	we watered the cow.
<i>dagiti babbái ti nañgpaabél.</i>	the women had it woven.
<i>isúda ti mamadígus iti nuáñg.</i>	they bathe the carabaos.
<i>awán ti mamaasin iti kárne.</i>	nobody has the meat salted.
<i>ti bakét ti mañgparikép.</i>	the old woman has it closed.
<i>ni Ana ti nañgpasóso iti ubíng.</i>	Ann gave the child the breast.
<i>dakamí ti namalukát iti roáñgan.</i>	we had the door opened.
<i>dakayó ti mamasrék.</i>	you have them come in.

ni Luis ti mamaraép ití tálón.
ti lakáy ti mamaágas ití masakít.
ti ubíng ti mamakáli.
isú ti mamagin-áwa kadatáo.
dagití mamasanǵbáy.
mamatpatúládka ití dákes.
ti panagikkisko ti pamaúlogko kada-
giti áso.

pamagásat daytá.
aniánto ti pañgpanánam?
daytáy maipapilit a pañgpawaywáy.
pamadagsén ití biág ti kinapañgláw.
pamalpaldáaǵ ti ipapatáy ti gay-
yém.

pamainumán daydiáy.
aniá ti pamaruárandá kadakamí?
adín ti namasosoám kenkuána?
ditáy ti pamakanák ití gayyémko.
pamasrekán daytá.
kasanó ti pammarigatda kadatáo.
ití kalpasán ti panañgpasúrotyo ken-
kuána.

kaanó ti panañgparigatna kenká?
ti panamaimbáña kadagiti masakít.
ti pammaadúna kadagiti parsuá.
ti pammaabáinda kadakuáda.
ti panamatalgédko.
siák ti mamabírok ití ubíng (from
pabiróken, bumírok).
siák ti mamabírok ití báñga (from
pabírok, biróken).

8. The combination *pañg . . . en* is changed into the complex prefix *mañgpañg* or *mamañg*, which is rarely used. Examples:

siká ti mamañgrabí kadakamí.
sadíno ti pañgpañgaldáwam kada-
giti ubbíng?
intonanó ti panañgpamigátyo kada-
kamí?

9. The complex prefixes *pai* and *paipa*, and the combination *pai . . . an* are changed into the complex prefixes *mañgpai* or *mamai* and *mañgpaipa* or *mamaipa*, respectively. Examples:

dakamí ti namayúlog.
ti kaaróbami ti mamaiserrek.
awán ti nañgpaipán.
siká ti mamaítúgot.
isúda ti namaipaw-ít.
awán ti namaidáit kenkuána ití bá-
do.

Lewis has the rice field planted.
 the old man treats the sick.
 the child has it dug.
 he tranquilizes one.
 the hosts.
 you give a bad example.
 my shouting puts the dogs out.

that is a charm.
 how shall we have them taste it?
 we must use this to give them space.
 poverty makes life difficult.
 the death of a friend makes one sad.

that is a place to water (horses).
 why do they put us out?
 where did you give it the breast?
 I feed my friend here.
 that is a means of making money.
 how do they treat one hard?
 after you have made him follow you.

when did he treat you hard?
 his curing the sick.
 his making the creatures multiply.
 their making them ashamed.
 my trust.
 I tell the child to look for it.

I have the pot looked for.

you make us have supper.
 where do you make the children have
 lunch?
 when will you make us breakfast?

we had it brought down.
 our neighbor has it brought in.
 nobody had it carried there.
 you tell (them) to take it with them.
 they had it sent.
 nobody had a coat made for him.

ditáy ti paṅṅpaikabilanna.
idiáy ti pamaibitinanda.
isú ti paṅṅpaibayoák iti bagás.

kaanó ti panaṅṅpaikáyogmo?

itá ti panamaipúlanṅda.
intóno bigát ti panmaikárona.

ti ubiṅ ti namaipakán.
dakayó ti mamaipainúm.
isú ti mamaipabásol.
awán ti paṅṅpaipainumánda.

aniá ti pamaipabasólanyo?

idí rabí ti panaṅṅpaipaáyda.
itáy malém ti panamaipalawágmi.

kaanó ti pammaipapuṅgánda iti bató?

NOTE 6. The instrumental prefix *paṅṅpai* or *pamai* joined to names of towns, provinces, and so forth, means that something is usefully brought to the people of that town, province, and so on. Substantives Including Verbal Notions.³ Examples:

pamaibaṅgárko daytáy.

paṅṅpailawágmo daytá.

he has it put here.
 they have it suspended there.
 that is where I have rice pounded for her.
 when did you make (him) take it with him?
 they have it returned now.
 tomorrow he shall have them expiate it.
 the boy had it given (to them) to eat.
 you have it given (to them) to drink.
 he has (them) accused of it.
 they have no place to have it given (to them) to drink.
 why do you have (them) accused of it?
 last night they had it applied to him.
 this afternoon we had it brought to Lawag.
 when did they have a stone used as a pillow?

this is a good thing for me to carry to Bangar.

that is just the thing for you to carry to Lawag.

II. THE PREFIX MA

I. The passive is formed by joining the adjectival prefix *ma* (past: *na*) to the substantival verb as it is, its prefixes and suffixes remaining intact, except the suffix *en* which is dropped. The construction of this prefix and its combinations is adjectival, and most of the following forms may be used as simple attributes.

It will be seen readily that very often the prefix *ma* includes the notion of possibility, and the past form *na* that of completion of the action. We have alluded to these peculiarities when we explained the adjectival prefixes *maka* and *ma*, and the substantival prefix *ma*.

All the forms of the prefix *maka*, which have been studied in the preceding pages, are of use here; but the frequentative prefix *mannaka*, the instrumental form *paka*, and the prefix for

³ The Iloko adjectival voice. Philip. Journ. Sci. 69 (1939) 249.

manner and time, *pannaka*, never allow any suffix, while the form for order or permission (*paka . . . en*) only allows the suffix *en* in the present, none in the past.

Here follow the most important forms:

1. The suffix *en* is changed into the prefix *ma*. Examples:

maála ti págay.
nalúto ti inapúy.
nabáutka?
awán ti makita.
nasagána ti pagiddaán.
nasatsát ti bádok.
siák ti madúsa.
mapigisto.
napúkaw dagiti talik.
idiáy ti nakagalipanna.
ditóy ti pakabiñgáyanna.
aniá ti nakaaramidanna?
idiáy tálon ti pakaabúganda.

kaanó ti pannakabilañgna?
itáy malém ti pannakadáitna.
kasanó ti pannakatarimáanna?
narígat ti pannakasimpána.
kasanó ti pannakalútona?

rice is taken.
 the rice is cooked.
 were you whipped?
 there is nothing to be seen.
 the bed is ready.
 my coat is ripped.
 I am punished.
 it will be torn.
 my ropes are lost.
 it was sliced there.
 it is distributed here.
 why did it happen?
 they are driven away from the rice field.
 when was it counted?
 it was sewn this afternoon.
 how is it arranged?
 it is hard to level it.
 how is it cooked?

NOTE. 7. *a*. Sometimes the initial consonant of the stem is changed into *m* or *n* after the prefix *ma*, giving the latter the form of the prefix *mañg*, although the meaning of the word remains essentially passive and does not at all become transitive; there is, however, a slight difference in the meaning of the ordinary form and that of the form in *m* or *n*, as the latter includes a certain shade of activeness. Perhaps the form alluded to in Notes on Iloko⁴ may be placed in the same line, with this difference, however, that *mañgabaróanan* may never become *makabaróanan*. Examples:

manuñgpálakon.
matuñgpálto ti konám.
nanarimáan ti panagbáyo.
natarimáan ti nabóonñ.

I am done for.
 what you say will be done.
 pounding rice was at its height.
 what was broken has been mended.

b. Complex prefixes derived from the above are: *matagi*, *makara*, *masag*, and so on. Examples:

matagináyon.
matagitáo ti baláyna.
awán ti natagiláko.
makarapugsát.
masaggabassít.

it keeps a long time.
 there are men in his house.
 nothing was sold.
 it is always snapped.
 it is done little by little.

⁴ Chapter I, VI. Syncopations. *Anthropos* 23 (1928) 1039.

2. The suffix *an* is changed into the combination *ma . . . an*.
Examples:

nasagádan ti silid.
naasinán ti inapáy.
maraepán komá ti tálon.
no maluktán ti roañgan.
nasilián ti digó.
makissayánto.
manayónan.
naayabán idi kalmán.
natakáwan ti gayyémko.
makapásan ti bañgkágmi.

the room is swept.
the rice is salted.
the rice field should be planted.
if the door is opened.
the broth is peppered.
it will be diminished.
it must be augmented.
he was called yesterday.
my friend was robbed.
our field will be planted with cotton.
it has been watered.
why is it watched?
it shall not get dirty here.
where were they helped?
when was he helped?
they are quickly watered.
how is it cleaned?

nadanumán.
aniá ti pakabantáyanna?
awán ti pakarugitánna ditóy.
sadino ti nakabadáñganda?
kaanó ti pannakatúloñgna?
nadarás ti pannakasibúgda.
kasanó ti pannakadalúsna?

NOTE 8. The combination *maka . . . an* with numbers is rarely used.⁵ Examples:

makaduáan.
saán a makaduáan, mamimpinsán lá-eñg.

it has a companion.
it does not happen twice, only once.

3. The prefix *i* is changed into the complex prefix *mai*. Examples:

naisúrat.
mayáyus ti róot.

it is written.
the grass is carried away by the current.

dagiti naisagána.
maipánto idiáy.
naiserrek ti alikámen.
maipúlañg komá.
naitaráy kanó.
awán ti naisubli.
isú ti naikúyog.
daytáy ti maisañgpet.
addá naipaw-it.
ti nakaipatoán.
dagiti pakaidindinnaánna.
sadino ti nakaiikabilánna?
ditóy ti pakaidissoánna.
idiáy ti nakaidulínanna.
kasanó ti pannakaibilañgna?
kasanó ti pannakaigálutna?

those that have been prepared.
it will be brought there.
the furniture is in.
it should be returned.
they say that they ran away with it.
nothing was brought back.
they took it with them.
this is what is brought home.
some has been sent.
the fate.
those whom he frequents.
where was it placed?
it should be put down here.
it was put aside there.
how is it considered?
how is it tied?

⁵ The Adjectival Prefix *Maka*. II. 4. Philip. Journ. Sci. 69 (1939) 234.

napintás ti pannakaimúlada.
itáy ti pannakaibátina.
intonanó ti pannakailibutna?

they are nicely planted.
 he was left just now.
 when will it be taken in procession?

NOTE 9. *a.* Other combinations derived from the above are: *mai...an*, *maika*, *maika...an* and others. Examples:

maidaitan iti bádo.
mainagánantayo.
ti naikasigud a kababalínna.
isú ti nakaikasigúdanda.
padapádada a nakaikapatáyan ti lin-tég.
maipakaoná.
ti pannakaipakaammóna.
maisañgaáwisak.
maisañgabáñgon.

he has a coat made for him.
 we are named.
 his natural habit.
 it is their nature.
 they fall under the same law.
 it is foretold.
 its announcement.
 I am also invited.
 it is raised also.

b. The form *maika* clearly illustrates the composition of the ordinal numbers. We refer the student to the section on the Number, where the ordinal numbers were discussed in detail.⁶

4. The prefix *ipa* is changed into the complex prefix *maipa*. Examples:

maipastrékda.
naipadpadúma.
maipalnédkanto.
maipabigát daytá.
naipabúlod kaniák.
maipakán ti págay.
maipaáy.
naipasúrong ti bábuy.
isú ti nakaipapilitak nga immyánen.

aniá ti nakaipababaánna?
kasanó ti pannakaipañgátóna?
idí kalmán ti pannakaipaárabda.

They are put inside.
 it is different.
 you will disappear.
 that will be left for tomorrow.
 it was lent me.
 he is fed with rice.
 it is convenient.
 the hog was brought up the river.
 that is why I was obliged to stay overnight.
 why was it brought downward?
 how was it raised?
 they were taken to the pasture yesterday.

NOTE 10. *a.* The combination *pakin...en* is changed into the complex prefix *mapakin*. Examples:

mapakindáya daytáy.
aniá ti nakapakinrabawánna?
kasanó ti pannakapakinruárna?

this must be put on the east side.
 why was it placed uppermost?
 how was it put outside?

b. The prefix *maipañg* differs from the prefix *maipa* in the same way as the transitive prefix *mañg* from the intransitive prefix *ag*. It is rarely used. Example:

naipannurók.

superabundant, more than (the others).

⁶ Anthropos 28 (1933) 714, 715.

5. The combinations *pi . . . en* and *pin . . . en*, and the complex prefixes *ipi* and *ipin* and *ikapi* and *ikapin* are changed into the complex prefixes *mapi* and *mapin*, *maipi* and *maipin*, and *maika-pi* and *maikapin*, respectively. Examples:

<i>maipitló.</i>	it is done three times.
<i>napinlimá.</i>	it was done five times.
<i>naipinpitó.</i>	it was done seven times.
<i>maipin-inném.</i>	it is done six times.
<i>napidúá.</i>	it was done twice.
<i>maikapinpát.</i>	it is done a fourth time.
<i>aniá ti pakapinsiamanna?</i>	why is it done nine times?
<i>pannakaipiduána a maimaldit.</i>	second edition.
<i>kasanó ti pannakaikapinwalóna?</i>	how was it done an eighth time?

NOTE 11. As the prefix *ma* has sometimes a tendency to become *ka*, especially in the formation of substantives, the preceding form abundantly illustrates what we have stated before about the composition of substantives which serve to indicate the degrees of kindred.⁷

6. The combination *pag . . . en* is changed into the complex prefix *mapag*. Examples:

<i>mapagúnġar.</i>	it is raised to life.
<i>napagsabák.</i>	I am told to talk.
<i>dagiti napagbabáwi.</i>	those who were brought to repentance.
<i>tapnó mapagtitipun ġġa agkaykaysá.</i>	so that it be made into one with the rest.
<i>ditóy ti nakapagsubliánna.</i>	it was sent back here.
<i>kasanó ti pannakapagtaráyna?</i>	how did they make it run?

NOTE 12. Other complex prefixes derived from the above are: *mapagi*, *mapag.inn.*, *mapagin*, and others. Examples:

<i>mapagikábil.</i>	he is ordered to place it.
<i>napagtitinnúlonġda.</i>	they were forced to help one another.
<i>mapaginsasánġitkayo.</i>	you are forced to simulate weeping.

7. The combination *pa . . . en* and the prefix *pa* are changed into the complex prefix *mapa*. Examples:

<i>napapúdaw.</i>	it was whitened.
<i>ti mapasúnġad.</i>	the future.
<i>mapatúlenġda ámin.</i>	they were all rendered deaf.
<i>mapasadútak ġġa aramíden.</i>	I am made unwilling to do it.
<i>napabílegak a napán.</i>	I was strengthened to go.
<i>napabpabásol ni gayyémko.</i>	my friend was accused.
<i>napaaddá ti bagás.</i>	rice was caused to appear.
<i>napatúluy ti sarítana.</i>	his story was finished.
<i>napakuti ti báġġa.</i>	the pot was made to move.
<i>napabáutkami.</i>	we were forced to whip.

⁷ Formation of Substantives. III. 5. *Anthropos* 26 (1931) 473.

napasagána ti ulés.

napaarámíd ti lamisáan.

ditóy ti nakapataráyánda.

awán ti pakapaboóñganna.

ditóy ti nakapadakkélan.

isú ti pakapadayáwak.

kaanó ti pannakaparsuá ti lúboñg?

intonanó ti pannukapainúm dagiti nuáñg?

kasanó ti pannakapaarámídná?

napabírok ti napúkawna (from pa-bírok, bíróken).

napabírok ti ubíñg (from pabíróken, bumírok).

a blanket was caused to be prepared.

a table was caused to be made.

they were driven here.

there is no reason to have it broken.

he was brought up here.

that is why I am honored.

when was the world created?

when will the carabaos be watered?

how will it be caused to be done?

what he lost was caused to be looked for.

the child was caused to look for it.

8. The combination *pañg . . . en* is changed into the complex prefix *mapañg*. Examples:

mapañgála ti lakáy.

napamírok dagiti ubbíñg.

the old man is forced to take it.

the children were forced to look for it.

9. The combinations *pa . . . an*, *pai . . . an*, and the like, are changed into the combinations *mapa . . . an*, *mapai . . . an*, and others. Examples:

maparañgkápan ti ubíñg.

napaldaáñgan dagiti naganák kenkuána.

napanagánan.

mapasagádan ti silíd.

maparikpán ti táwa.

napatulónghan ti anákko.

mapalandaan ti lalat.

ditóy ti pakapaluktán ti táwa.

the child is caused to be given a present.

his parents were grieved.

he was named.

the room is caused to be swept.

the window is caused to be closed.

my son was caused to be helped.

the leather is caused to be oiled.

the window is caused to be opened here.

kaanó ti pannakaparaép ti tálon?

when was the rice field caused to be planted?

mapaigatáñgan ni Juána ití bádo ti anákna.

Joan was caused to be given a coat for her child.

10. The complex prefixes *pai*, *paipa*, and the like are changed into the complex prefixes *mapai*, *mapaipa*, and so on. Examples:

mapairuár ti págay.

napaibabá ti atépna.

mapaidúlin ti bagás.

napaigatáñg ti salapi.

napaipúlañg.

ditóy ti pakapaisubliánna.

rice is caused to be taken out.

its roof was caused to be lowered.

the rice is caused to be put away.

fifty centavos were given to buy it.

it was caused to be returned.

it is caused to be returned here.

kasano ti pannakapayunegna?
napaipabulod ti banngami.
mapaipaunta ng ti pirakda.
napaipainum dayta danum.
idiay ti nakapaipalaudanna.

how was it caused to be put inside?
 our pot was caused to be lent.
 their money is caused to be lent.
 that water is caused to be drunk.
 there it was caused to be brought
 westward.

kaanó ti pannakapaipasúronṅna?

when was it caused to be brought up
 the river?

kasano ti pannakapaipadáyana?

how was it caused to be put east-
 ward?

II. These forms may be used with the substantival construction as has been stated before under the Substantival Prefix *Ma*,⁸ and whatever has been said about the adjectival prefix *ma* in section I may be repeated here for the substantival prefix *ma*, except: (a) that the latter is substantival in construction, while the former is adjectival; (b) that the latter indicates either active possibility or completion of the action, while the former represents the passive voice.

1. The prefix *ma*. Examples:

masápulko.
nakitami ti púsayo.
naawánna ti riknána.
nakámatyo idá.
naáwismi dagiti gayyémni.
makamákkamminto idá.
maáwatko ti konám.
maláonna ti uppát.
nabátik idiáy.
nabáutko.
adino ti nakakabilam kenkuána.
aniá ti pakasapulám itá?
kasano ti pannakakitam iti baláyko?
kaanó ti pannakaaramidmo itá agá-
manṅ?

I need it.
 we saw your cat.
 he lost his senses.
 you caught them.
 we convinced our friends.
 we shall catch up with them.
 I understand what you say.
 it holds four.
 I left it there.
 I whipped him.
 where did you beat him?
 what do you want there?
 how can you see my house?
 when did you make that granary?

NOTE 13. Complex prefixes derived from the above. Examples:

natagikuámi dagitoy nga alikámen.
natagináyonna ti siñgpétna.
makarasúratko.
masaggabassítna nga aramiden.

we owned this furniture.
 he remained virtuous.
 I can write it continually.
 he makes it by little and little.

2. The combination *ma . . . an*. Examples:

didanto maramanán ni patáy.
naasinánmi ámin.
maraepánminto no bigát.
nadalusák ti silid.

they will not taste death.
 we salted it all.
 we shall plant it tomorrow.
 I cleaned the room.

⁸ The Iloko substantival voice. Philip. Journ. Sci. 71 (1940) 22.

naugásanyo dagiti piñggán.
narikipántayo idá ámin.
malukatánda.
nakartibanda ti lupot.
sadin ti pakalanáanda kadagiti sa-
pátos?
sadin ti nakatulónḡanda kadagiti
gayyémimi?
kaanó ti pannakalúkasda kadagitá?
kaanó ti pannakabáliwmi itá?

NOTE 14. The combination *maka . . . an*. Example:

nakawaloándakami.

3. The complex prefix *mai*.

naisimpána.
maisabálik.
mayúlogna kanó.
nayúlina ámin.
naipakatna.
maipaw-itna ti súrat.
naibabámi idá.
naipulaḡmi ti binúlodmi.
daytáy ti pakailasinanyo ṅga ina-
yák.
sadin ti pakaikabílam kadagitá?
kaanó ti pannakailisimi iti peggád?
kaanó ti pannakayálisyo kadagiti kú-
kuayo?

NOTE 15. Other combinations derived from the above. Examples:

tapnó maidawátam idá.
naigatánḡanyo ti baláy.
maibirókanminto.
naikasígudna.
ti kinabaknáḡko naikasigúdak únay.

4. The complex prefix *maipa*. Examples:

naipainúmko ámin.
maipakánna ti págay.
naipabontókna.
maipaḡátomi.
sadin ti nakaipababaánda kadagitá?

kaanó ti pannakaipasúroḡmi kada-
kuáda?
kaanó ti pannakaipapunḡántayo itá?

NOTE 16. The complex prefix *mapakin*. Examples:

mapakindáyak.
napakin-amiánanna.

did you wash the dishes?
 we closed them all.
 can they open them?
 they cut off a part of the cloth.
 where can they oil the shoes?

where did they help our friends?

when did they uncover those?
 how can we change that?

they took eight of us.

he leveled it.
 I talk about something else.
 they say that he can translate it.
 he brought them all in.
 he harnessed it.
 he can send the letter.
 we lowered them.
 we returned what we lent.
 this is how you will know my com-
 ing.
 where can you put those?
 how can we avoid danger?
 when did you move your property?

so that you can ask things for them.
 did you buy a house for him?
 we shall find it for him.
 he always was so.
 I was rich from the very beginning.

I had it all drunk.
 he can have the rice fed.
 he had it brought toward Bontok.
 we can raise it.
 where did they bring those down-
 ward?
 when did we bring them up the ri-
 ver?
 how can we use that as a pillow?

I can put it on the east side.
 he put it on the north side.

5. The complex prefixes *mapi* and *mapin*, *maipi* and *maipin*, and *maikapi* and *maikapin*. Examples:

<i>napitlók.</i>	I did it three times.
<i>mapinlimámi.</i>	we can do it five times.
<i>naipiduána.</i>	he did it twice.
<i>maipinsíamna.</i>	he can do it nine times.
<i>maikapinpátna a mapán.</i>	he can go there a fourth time.
<i>maikapinpitóyo nga inarámid.</i>	you did it a seventh time.

6. The complex prefix *mapag*. Examples:

<i>saánda a mapaglásin dagitá.</i>	they cannot see the difference between those.
<i>napagbirokmi idá a duá.</i>	we had them both look for it.
<i>mapagtálawyo idá ití áso.</i>	can you have them drive away the dog?
<i>napagsarítada ni Juán.</i>	they made John talk.
<i>saánmi a napagságad ti ubíng.</i>	we could not make the boy sweep it.
<i>mapagádalna ti anákna.</i>	he can make his son study.
<i>sadín ti pakapagaramídanda kada-kuáda?</i>	where can they have them make it?
<i>kasanó ti pannakapagdáityo kada-kuada?</i>	how can you make them sew it?

NOTE 17. Other complex prefixes derived from the above. Examples:

<i>mapagisañgpétmi.</i>	we can make them bring it home.
<i>napagsinnublátmo.</i>	you made them take turns.
<i>mapaginbubulsékko dagitá.</i>	I can make those simulate blindness.

7. The complex prefix *mapa*.

<i>mapabirokko ti ubíng (from pabiróken, bumírok).</i>	I can have the child look for it.
<i>mapabirokko ti nuáng (from pabírok, bíróken).</i>	I can have the carabao looked for.
<i>mapaimbágmi dagitoy.</i>	we can cure these.
<i>napasápultayo dagiti nuáng.</i>	we had the carabaos looked for.
<i>mapatugáwyo idá.</i>	you can have them sit down.
<i>napatakderda idá ámin.</i>	they had them all stand up.
<i>mapabáutmo ti anákmo?</i>	can you have your child whipped?
<i>napasaplitmi ti nagsúkir.</i>	we had the disobedient one whipped.
<i>napasublína a sikakaradkád.</i>	he had him brought back in good health.
<i>dagiti mapasúrotda.</i>	their followers.
<i>idí napasañgpétna toy anákna.</i>	when he had this son of his brought home.
<i>sadín ti nakapainumánda kadakuáda?</i>	where did they have them watered?
<i>sadín ti pakapaalántayo?</i>	where can we have it taken from?
<i>kasanó ti pannakapakánmi?</i>	when did we feed him?
<i>kasanó ti pannakapaarámidko?</i>	how can I have it made?

8. The complex prefix *mapaṅg*. Examples:

mapaṅgaldáwmi idá.
napamigátko ti gayyémko.
napanaplityo ti lakáy?

napaṅgálam dagiti bakét iti kayátmo?

we can make them take lunch.
 I made my friend breakfast.
 did you make the old man whip them?
 did you make the old women take what you want?

9. The combinations *mapa . . . an*, *mapai . . . an*, and the like.

mapasagádam ti silid.
naparaepánmi ti tálon.
mapalukatántayo dagiti táwa.
naparikipánda idá.
napatapiányo ti bito.
napaayabánda ti gayyémnda.
mapatulónṅanmi ti nakákaasi.
mapasukatánta dagidiáy?
sadino ti pakapabayádam iti útaṅgmo?

kasanó ti pannakapaasinmi kadagítá?

kaanó ti pannakapapágayyo iti tálon?

mapayaramídanmi ti baláy?

napaibayoánmi idá.

mapaidawátanda idá ti kalikagúman-da.

kasanó ti pannakapaigátanṅda kadakuáda iti lípot?

can you have the room swept?

we had the rice field planted.

we can have the windows opened.

they had them closed.

you had the pit covered with a stone.

they had their friend called.

we can have the miserable helped.

can we have those changed?

where can you have your debt paid?

how can we have those salted?

when did you have rice planted in the rice field?

can we have a house made for him?

we had people pound rice for them.

they can have what they desire asked for them.

how can they have cloth bought for them?

10. The complex prefixes *mapai*, *mapaipa*, and the like. Examples:

mapaitúgotmi idá ámin.

napairuártayo.

napaipúlāṅko ti inpabúlodko.

napaisaṅpétda dagiti tarikáyo.

mapayálisna ti baláyna.

napaidúlinmi ti pirák.

napaikastámi.

idiáy baláymi ti nakapaibatiánda iti ásoda.

ditóy ti nakapaidissoám.

sadino ti pakapaidissaáganmi kadakuáda?

itáy ti pannakapaikábilda kadakuáda.

idí kalmán ti pannakapaisublími kadagitóy.

we can have people take them all with them.

we had them taken out.

what I lent I had brought back.

they had the timber brought home.

he can have his house moved.

we had the money put away.

we had it done like that.

they had their dog left in our house.

you had it put down here.

where can we have them taken off?

they had them placed just now.

yesterday we had these brought back.

kaanó ti pannakapaipaw-ityo?
kasanó ti pannakapayunégmi?
mapaipasúroñgmi ti manók.

napaipabásolda ití kaaróbada.

idiáy ti pakapaipababaányo kadagití
burnáy?

kasanó ti pannakapaipalawágda ka-
dakuáda?

kaanó ti pannakapaipaditóyyo ití
nuánñ?

when did you have it sent?
 how can we have it put inside?
 we can have the chicken brought up
 the river.

they had their neighbors accused of
 it.

can you have the jars lowered there?

how can they have them brought to
 Lawag?

when had you the carabao brought
 in this direction?

NOTE 18. *a.* We have seen under the adjectival prefix *ma*° how the suffix *an*, as a true locative, may modify the meaning of a verb in *ma*. It should be noted that there is a great difference of origin between these forms in *ma . . . an* and those explained under I, 2, and II, 2, above. In the latter forms the suffix *an* belongs to the original substantival verb, with which the prefix *ma* has been combined to form either an adjectival passive verb or a substantival verb meaning possibility or completion of the action, while in the former the suffix *an* does not belong to the original substantival verb, but is simply a modification of the verb in *ma*. Both forms however, are identical in construction and meaning.

Besides the examples given under the adjectival prefix *ma*, where the prefix was a simple one, we give here some other examples of forms in *ma . . . an*, where the prefix is either simple or complex. Examples.

Adjectival:

<i>mapakuyógan ití dakkél a panna-</i> <i>kabalín.</i>	it is accompanied by great power.
<i>mapaawitánda ití nadagsén.</i>	they are loaded with heavy burdens.
<i>nalaká a mapasagídan.</i>	he is easily offended.
<i>mapabpabutñgánda.</i>	they are frightened.
<i>madanáganak.</i>	I am very much worried.
<i>nabannogán dagití táo.</i>	the men were tired out.
<i>saán a maawátan.</i>	it cannot be understood.
<i>marigátan.</i>	he is dangerously ill (or, he is in a difficult position).

Substantival:

<i>maawátak ámin.</i>	I understand everything.
<i>masapulakto.</i>	I shall find it.
<i>nabirókanmi daydí kallogónñ.</i>	we found that hat.
<i>napasagidak ní gayyémko.</i>	I hit my friend (by some allusion).
<i>napaawitánda idá ití nadagsén.</i>	they gave them a heavy load.
<i>mapakuyógantay idá.</i>	we can have them accompanied.
<i>napabutñgánna ti anákna.</i>	he frightened his son.

° The Iloko Adjectival Voice. Philip. Journ. Sci. 69 (1939) 240.

b. The past form *nai . . . an* may sometimes become *nain . . . an*.¹⁰

Examples:

<i>nainkalintegán.</i>	having the right.
<i>ti nainkasigúdanyo a pagimbagán.</i>	your original welfare.

c. The prefix *ma* may sometimes be changed into *ka*, without changing the meaning of the word. Its past form remains *na*. Examples:

Adjectival:

<i>dinto ñgatá kaibuksílan.</i>	perhaps it will be impossible to explain it.
<i>di kasupapákan.</i>	it cannot be gainsaid.
<i>di kaliklíkan.</i>	it cannot be avoided.
<i>ti di kalansádan a panangñgaásina.</i>	his immeasurable mercy.
<i>a kas kaimatánñgan iti inarámidmo.</i>	as may be seen by what you did.

Substantival:

<i>kaikariánna ti taráonna.</i>	he deserves his sustenance.
<i>no kaay-áyonakto pay.</i>	if you will still be able to coax me.
<i>díkam komá kalipátan ti imbáña.</i>	we should not forget his kindness.
<i>kaimatánñgantayo ti balákadna.</i>	let us heed his advice.
<i>diák kasurótan.</i>	I cannot follow it.
<i>kagteñgánminto.</i>	we shall be able to reach it.

III. IRREGULAR AND DEFECTIVE VERBS

Nearly all the verbs of the Iloko language are formed by joining prefixes, infixes, or suffixes to verbal stems, as has been explained above. However, there are a few defective verbs and a few others which have some distinctive peculiarities, and we shall say a word about them here.

1. IN

This verb, which means "to go", and is often used as an auxiliary, always remains invariable, and allows neither prefixes nor suffixes.

I. When used by itself *in* follows the rules of the adjectival voice, and consequently allows the personal pronouns of the second series. When the personal pronoun of the third person singular (second series) is understood, or when the subject of the verb is emphasized, the verb *mapán* takes the place of *in*, because the latter never stands by itself; the verb *napán* is generally preferred also for the past tense. Examples:

<i>innak idiáy.</i>	I go there.
<i>ínka idiáy baláymo.</i>	go to your house.
<i>ínkami.</i>	we go.

¹⁰ Comparatives and Superlatives. III. 3. *Anthropos* 26 (1931) 479, note.

inda idiáy Baknótan.

mapán.

isúda ti mapán.

siák ti napán.

napánkami.

they go to Baknotan.

he goes.

it is they who go.

it was I who went.

we went.

II. When used as an auxiliary, it depends on the construction of the principal verb, and *mapán* (past: *napán*) often takes its place, if the personal pronoun of the 3d person singular is understood or if the principal verb is in the past. The peculiarities connected with the use of the possessives, when *in* serves as an auxiliary to substantival verbs, have been alluded to in another paper.¹¹ Examples:

innak uminúm.

intayo manḡán.

inkay aláen.

inna saganáen.

ti bakét ṅga in sarongkáran ti la-káy.

ti úleg a mapán patayén ni Juan.

no in agsáad.

mapán matúrog.

ti ubiṅ ṅga in nagdaydayaw ken-kuána.

inkam inála or napánmi inála.

napánkami naṅgála.

I go to drink.

let us go to eat.

go and take it.

he goes to prepare it.

the old woman whom the old man goes to visit.

the snake that John goes to kill.

when he goes to get a position.

he goes to sleep.

the child who went to revere him.

we went to take it.

we went to take some.

NOTE 19. This auxiliary is sometimes added to another word without changing the latter's meaning, especially in poetry and flowery speech. Examples:

ti inna kasasáad.

idi inna kasistigud.

ti turáy ti inna kadinnaég.

in makláat.

indakto patién?

his position.

at its beginning.

the authority is what he revere.

it happens suddenly.

will they believe me? are they going to believe me?

2. PAN

This stem allows several of the prefixes and suffixes of both the adjectival and the substantival voice, but the verbs it forms are irregular in many respects.

1. *Mapán* (past: *napán*): to go. When used by itself, this form follows the rules of the adjectival constructions; when used as an auxiliary, it depends on the construction of the principal

¹¹ Possessives. 2. Peculiarities. *Anthropos* 28 (1933) 691.

verb for its own adjectival or substantival construction. Examples:

<i>mapánkami.</i>	we go.
<i>napánkayo idiáy.</i>	you went there.
<i>mapánkami mañgála.</i>	we go to take some.
<i>napán nagsúrat.</i>	he went to write.
<i>mapánmi aláen.</i>	we go to take it.
<i>napánna insúrat.</i>	he went to write it down.

1. The form for the place where one goes is *papanán* (past: *napanán*), instead of *pakapanan*. Examples:

<i>sadín ti papanám?</i>	where do you go?
<i>idiáy ti napanánna.</i>	he went there.

2. The form for the manner how and the time when one goes is *ipapán*, instead of *pannakapan*. Examples:

<i>intonanó ti ipapánna?</i>	when does he go?
<i>maipapán iti ipapánna.</i>	concerning his going.

NOTE 20. The regular verb *agapán* and the auxiliary *apán* (past and present) occur sometimes. Examples:

<i>managapán.</i>	he often goes.
<i>magun-ódnanto ti apánna gagaráen.</i>	he will obtain what he intends going there.

II. *Ipán*, to carry, to bring, and *ipapán*, to deem, are regular substantival verbs in *i* and *ipa* respectively, which may be combined with other prefixes and suffixes. Examples:

<i>ipánmo idiáy.</i>	carry it there.
<i>inpánko ken áma.</i>	I carried it to my father.
<i>siák ti nañgipán.</i>	I carried it.
<i>naipánen.</i>	it was carried already.
<i>sadín ti nañgipanányo?</i>	where did you carry it?
<i>isú komá ti agipán idiáy baláymi.</i>	he should carry it to our house.
<i>paipánmo.</i>	have it carried.
<i>ipapánko a dákes.</i>	I suppose it to be bad.
<i>managipapánkayo.</i>	you are suspicious.

NOTE 21. *Agpapán* represents the preposition "till", and *maipapán*, the conjunction "concerning".¹²

3. U MAY

The prefix *um* of the verb *umáy*, which means "to come", is sometimes considered as a part of the stem in combinations with other prefixes or suffixes. Examples:

<i>paumayém ditóy.</i>	have him come here.
<i>agkaraumáy.</i>	he comes all the time.

¹² The Preposition. III, 1. The Conjunction. IX. The Conjunction "Concerning". I. Unpublished.

4. PAGNA

I. The verbs formed with this stem are entirely regular in most of their forms. Examples:

<i>nagpaggagná.</i>	he was walking.
<i>makapagná.</i>	he can walk.
<i>ipagnána ti bákes ditóy.</i>	he comes along here with the monkey.
<i>paggagnáem idiáy.</i>	make him walk there.
<i>ti panamagpagnák kenkuána.</i>	my ordering him to walk.
<i>itáy ti panañgpagnána kaniák.</i>	he ordered me to walk just now.

II. The following forms are irregular:

1. *Magná* (past: *nagná*), to walk, which is a contraction of the adjectival prefix *ma* and the stem *pagná*. Examples:

<i>magnákami apó.</i>	we come along, Sir.
<i>magnáda idiáy bán̄gír.</i>	they walked at the other side.

2. The form for the place where one walks is *pagnáan* (past: *nagnáan*), instead of *pakapagnaan* or *pakagnaan*. Examples:

<i>awán ti pagnáan ditóy.</i>	this is no thoroughfare.
<i>idiáy ti nagnáanna.</i>	he passed there.

3. The form for the manner how and the time when one walks is *pannagná*, instead of *pannakapagna* or *pannakagna*. Examples:

<i>kitáem ti pannagná ti lakáy.</i>	look how the old man walks.
<i>kaanó ti pannagná ti ubiñg.</i>	when did the child walk?

5. KAYAT

This verb, which means "to like, to be willing", follows the rules of the substantival construction. It is a contraction of the prefix *ka* and the stem *ayát*.

1. In the present it is used without any further prefix or suffix; its past form is *kinayát*. Examples:

<i>kayátko daytá.</i>	I like that.
<i>kayátna ti uminúm.</i>	he wants to drink.
<i>kinayátda.</i>	they liked it.
<i>kinayátmi idi kalmán.</i>	we liked it yesterday.
<i>nalaús ti panañgkayátda itóy ásomí.</i>	they like this dog of ours very much.

2. The substantival form *kayatén*, for the present, and the forms of the adjectival prefix *ag* (*agkayát*, and the like), occur occasionally. Examples:

<i>kayaténna.</i>	he likes it.
<i>aniá ti pagkayatánna?</i>	why does he like it?
<i>idi kalmán ti panagkayátna.</i>	he liked it yesterday.

6. MAYAT

1. This verb, which has the same meaning as *kayát*, follows the rules of the adjectival construction and is ordinarily invariable. It is a contraction of the prefix *ma* and the stem *ayát*. Examples.

mayátkami.

we are willing.

mayátkayo idi kalmán.

you were willing yesterday.

2. The form *nayát*, for the past, and the forms of the adjectival prefix *ag* (*agmayát*, and the like) occur occasionally. Examples:

nayát a nanḡayáb.

he was willing to call him.

kasanó ti panagmayátko?

how can I be willing?

7. MADI

1. This verb, which means "to be unwilling, to refuse," follows the rules of the adjectival construction and is always invariable. It is probably a contraction of the prefix *ma* and the stem *adí*, as is shown by the form in *ag* of the regular verb *agadí*. Examples:

madi ni Juán.

John refuses.

madi pay láeṅṅ idi kalmán.

he still refused yesterday.

2. The forms of the adjectival prefix *ag* (*agmadi*, and so on) occur occasionally. Examples:

nagmadi.

he refused.

aniá ti pagmadiánna?

why does he refuse?

8. ITÉD

1. This verb, which means "to give", may be used, in the substantival construction, either by itself or with the suffix *en* (*itédén*), which has become obsolete. It has only one past form: *intéd*. Examples:

itédmo daytá.

give that.

intédna kadakámi.

he gave it to us.

*itédm kadakám ití aldáw itóy ti ká-
nénmi a patináyon ṅga aldáw.*

give us today our daily bread.

kait-itédna.

they just gave it.

2. When used with the suffix *an*, it is entirely regular and has a double nominative. Examples:

itdánnak ti birókek.

give me what I look for.

initdánmi ni Juána ti tinápay.

we gave Joan bread.

3. With the forms of the prefix *mañg*, it may lose its initial vowel.

siák ti nañgtéd.

asin ti nañgtedánna?

kaanó ti panañgtédna?

awán ti mañgítéd.

I gave it.

to whom did he give it?

when did he give it?

nobody gives it.

NOTE 22. The stem of this verb is probably *ted*, and its initial *i* is probably the prefix *i* of substantival verbs, as may be inferred from the form *itdán*, with the double nominative. The only difficulty is in the form *itén*, as the prefix *i* is never combined with the suffix *en*; but, as has been noted above, that form has become obsolete, and is perhaps entirely wrong. The second *i* of *initdán* is probably purely euphonic, as it would be impossible for an Iloko mouth to pronounce *intdán*, or it may be that the *i* is considered as a part of the stem because *ted* is a monosyllable. Compare the verb *umáy*.

9. IKKAN

This verb (past: *inikkán*), which means "to give, to put in", includes the special meanings of both the prefix *i* and the suffix *an* of the substantival voice; therefore it may have a double object and, consequently, a double nominative. When a possessive is added to it, the final *an* is considered as a suffix; and, in combinations of prefixes with the suffix *an* (*pañg* . . . *an*, and the like), the final *an* of the verb takes the place of the suffix. Examples:

ikkám ni Juána ti tinápay.

inikkánna ti burnáy ti danám.

asin ti pañgikkák?

daytáy ti nañgikkánmi.

maikkántayo ti pannakaammó.

sadino ti pakaikkánna?

give Joan bread.

he put water in the jar.

to whom should I give it?

we put it in this.

we are given knowledge.

where should it be put?

10. YEG

This verb (past: *inyég*), which means "to bring," is regular, if the first letter is considered as the substantival prefix *i*. Examples:

yégmo ditáy.

inyégko.

kaanó ti panañgyégna?

mayégminto.

nayég idi kalmán.

bring it here.

I brought it.

when did he bring it?

we shall bring it.

it was brought yesterday.

11. PAMAYAN

1. When this verb means "to think," it is always invariable, except for the final *an*, which is simply a substantival suffix. Examples:

<i>awán pamayák.</i>	I think he is not there.
<i>isú ti immáy pamayánmi.</i>	we thought it was he who came.
<i>masúrotkonto pamayák.</i>	I think I shall be able to follow it.
<i>addá pamayánda.</i>	they think there is some.
<i>bassít a básol daytá pamayáño.</i>	you think that is a small sin.

2. When this verb means "to do things without fervor," it allows the forms of the adjectival prefix *ag*. Example:

<i>agpampamayán ni Juán.</i>	John acts without enthusiasm.
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12. KONA

1. This verb, which means "to say, to think", is mostly used without any prefix or suffix in the present, in which case it follows the rules of the substantival voice. Its past form is *kinoná*. Examples:

<i>konák ñga immáy.</i>	I thought he came.
<i>konána a madí.</i>	he said he won't.
<i>isú ti konáda.</i>	that is what they say.
<i>konák ñga addá.</i>	I say that he is there.
<i>si asínoak ti koná dagití táo?</i>	who do the men say I am?
<i>kinonámi ñga awán.</i>	we thought he was not there.
<i>kastá ti kinonáda.</i>	they said so.

2. When used in the adjectival voice, it allows the forms of the prefix *ag*. Examples:

<i>addá agkoná.</i>	some people say so.
<i>asín ti nagkoná?</i>	who said so?
<i>pagkonaák a kastá ta awán ti umáy.</i>	I think it is so because nobody comes.
<i>kaanó ti panagkonána?</i>	when did he say so?

3. The substantival form *konaén* for the present, and the forms of the prefix *ma* and the substantival prefix *pa*, occur occasionally. Examples:

<i>konaén dagití lakáy.</i>	the old men say.
<i>konaénna.</i>	he says.
<i>makoná.</i>	it is said.
<i>makoná daytáy nákemko.</i>	I think (literally: my mind here says).
<i>makonána ñga isú.</i>	he says it is he.
<i>pakpakonák.</i>	I talk at random.

13. KANÓ

This verbal form, which translates the latin "dicitur", "it is said, they say", always stands by itself and allows no prefixes, infixes, or suffixes, nor any addition of pronouns, nor any connection by ligatures. It ordinarily follows the first word of the sentence it determines; however, sometimes it appears further down the sentence. When *koná* and *kanó* are used together, the latter always follows. Examples:

<i>awán kanó.</i>	he is not there, they say.
<i>immáyda kanó.</i>	they say that they came.
<i>addá kanó táo idiáy baláy.</i>	there is a man in the house, they say.
<i>isú kanó ti napán nagtákaw.</i>	it is said that it was he who went to steal.
<i>ti kanó lakáy ti immáy.</i>	it is said that it was the old man who came.
<i>ket idi nagánida kanó addá nakítada</i> <i>nga úleg.</i>	and when they gathered the harvest, they say, they saw a snake.
<i>wen konána kanó.</i>	he said: "yes," they say.

14. AMMÓ

The verbs formed with this stem are regular except in one case: when it means "to know", *ammó* may be used without any prefix or suffix, and then it follows the rules of the substantival voice, and remains invariable in both the present and the past tenses. Examples:

<i>ammók.</i>	I know it.
<i>awán ti ammómi.</i>	we know nothing.
<i>addá táo ditóy ket ammóyo.</i>	there is a man here and you know it.
<i>ammók idi.</i>	I knew it formerly.
<i>ammóna idi kalmán.</i>	he knew it yesterday.
<i>ammóda a dákes ket inarámida met</i> <i>luéng.</i>	they knew it was bad and still they did it.

15. MATÚROG

I. This verb, which means "to sleep", generally retains its adjectival prefix *ma* as a part of the stem in reduplications and combinations with other prefixes. If the prefix *ma* is dropped, it generally allows the forms of the prefix *ag* (*pag . . . an*, and the like) or the infix *um* (*pa . . . en*). Examples:

<i>matúrogkami.</i>	we sleep.
<i>napán nagmatúrog daydí lakáy.</i>	that old man went to sleep.
<i>saán nga appakatúrog ti ubíng.</i>	the child does not allow one to sleep.
<i>matmatúrogda.</i>	they are sleeping.
<i>awán ti pagturóganda.</i>	they have no place where to sleep.
<i>paturógem idá.</i>	make them sleep.

II. 1. Its frequentative is *mannatúrog*, instead of *mannakaturog*. Example:

mannatúrogkayo. you are great sleepers.

2. The form for the manner how and the time when one sleeps is *pannatúrog*, instead of *pannakaturog*. Example:

kasano ti pannatúrogmi ditáy? how can we sleep here?

16. PATAY

I. A. The verbs formed with this stem, which means "death", are regular in most of their forms. Examples:

<i>agpatáy.</i>	he faints.
<i>agpapátay.</i>	he commits suicide.
<i>ni patáy.</i>	death (personified).
<i>aginpapatáy.</i>	he simulates death.
<i>dika mamapátay.</i>	do not kill.
<i>patayém.</i>	kill him.

B. The following forms are irregular:

1. *Matáy* (past: *natáy*), to die, is a contraction of the adjectival prefix *ma* and the stem *patáy*. Examples:

<i>matáyak.</i>	I die.
<i>natáy idi kalmán.</i>	he died yesterday.
<i>addá minatáymi.</i>	we have a dead person (in the house).
<i>dagiti nainatáy.</i>	the dead.

2. The form for the place of death is *pakatayán* (past: *nakatayán*).

<i>idiáyto ti pakatayám.</i>	you will die there.
<i>sadin ti nakatayánna?</i>	where did he die?

3. The form for the manner how and the time when one dies is *ipapatáy*, instead of *pannakatáy* or *pannakapatáy*; these latter forms are sometimes used to render the word "death". Examples:

<i>napintás ti ipapatáyda.</i>	they died beautifully.
<i>kaanó ti ipapatáyna?</i>	when did he die?
<i>ti pannakatáy.</i>	death.
<i>ti pannakapapatáy.</i>	death.

II. The accentuation of the forms of this verbal stem seems very confusing at first, although the rule is very simple: whenever the prefix *pa* enters the composition of the word, the penult of the stem bears the accent (7 to 13, below); else, the last syllable (1 to 6, below). If the original open syllable is redupli-

cated and no prefix *pa* added, the last syllable bears the accent and our rule stands (5 to 6, below).

The only difficulty lies in the fact that the initial open syllable of the stem is *pa*; but, when the word means "to die", the *pa* is simply a reduplication (5 to 6, below), while, when it means "to kill," the *pa* is a prefix (7 to 13, below). Examples:

- | | |
|----------------------------------|--------------------------|
| 1. <i>matáy.</i> | he dies. |
| 2. <i>ditóy ti nakatayánda.</i> | they died here. |
| 3. <i>pumatáy.</i> | he threatens killing. |
| 4. <i>patayénna.</i> | he kills him. |
| 5. <i>ti ipapatáymi.</i> | our death. |
| 6. <i>ti panagpapátáy.</i> | mortality. |
| 7. <i>nagpapátay.</i> | he committed suicide. |
| 8. <i>ti panagpapátay.</i> | suicide. |
| 9. <i>nagpapapátay.</i> | he ordered murder. |
| 10. <i>isú ti namapátay.</i> | he was the murderer. |
| 11. <i>papapátayda.</i> | they have him killed. |
| 12. <i>napapátay idi kalmán.</i> | he was killed yesterday. |
| 13. <i>napapátayna.</i> | he had him killed. |

17. ALÉG

This verb, which means "to hasten", and the like, is used only in some districts.

1. When used without reduplication, it ordinarily has no prefix or suffix in the present, and then it follows the rules of the substantival voice. Its past is *inalég*. Examples:

- | | |
|---------------------------|----------------------|
| <i>alégmo ti magná.</i> | walk quickly. |
| <i>alégmo ti agsúrat.</i> | write quick. |
| <i>inalégko daytá.</i> | I did it in a hurry. |

2. When used with the reduplication of the first syllable (*al-alég*), it allows the forms of the adjectival prefix *ag*, the substantival suffix *en*, the substantival prefix *i*, and the like; sometimes, however, these forms are used without reduplication of the stem. Examples:

- | | |
|--------------------------------|----------------------------------|
| <i>al-alégmo.</i> | be quick. |
| <i>dika ammó ti agal-alég.</i> | you do not know how to be quick. |
| <i>al-algém.</i> | hurry him. |
| <i>inal-alégko.</i> | I hurried him. |
| <i>yál-alégmo.</i> | be quick. |
| <i>agalég.</i> | he is in a hurry. |

DIFFUSION CHARACTERISTICS OF SOME PHILIPPINE VEGETABLE TANNING EXTRACTS

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TWELVE TEXT FIGURES

This paper is a continuation of the work this bureau has been doing recently on Philippine tanning materials.(1-3, 17, 18)

The tanning process consists essentially in treating the hide or skin with something that will penetrate or diffuse into the hide, and later fix, or combine chemically with the hide substance (collagen).

A study of the most appropriate conditions for the diffusion of tanning liquors into hides is therefore of basic importance for the manufacture of leather.

Collagen is the principal constituent of hides. In physical properties collagen resembles gelatin. In fact, when collagen is heated with water at 70° C., it passes into solution as gelatin. Hofmeister(7) suggests that collagen is an anhydride of gelatin.

This report gives the results of diffusion experiments as affected by changes of acidity and time of contact between tannin extracts and gelatin.

Both Philippine and foreign vegetable tanning extracts were used in this work, in order to compare the relative diffusion characteristics of these different materials.

The Philippine extracts were obtained from plants that are extensively distributed in the Philippines. They all contain commercial quantities of tannin.(2)

EXPERIMENTAL PROCEDURE

The following Philippine materials were used: *a*, *anabiong*, *bitaog*, *kalumpit*, and *kariskis* barks gathered from trees growing near Los Baños, Laguna Province; aqueous extracts were prepared from these barks, and adjusted to contain 2 per cent of total solids.

Anabiong (*Trema orientalis* Blume) (14) is a medium-sized tree, reaching a diameter of 30 to 40 centimeters. The bark is characterized by a white appearance due to the presence of lichens. *Anabiong* is found throughout the Philippines at low and medium altitudes. It grows very abundantly in deserted clearings and second-growth forests. The bark is a source of tannin, and being stringy it is also used as twine. (6) In Batangas Province it is also used for dyeing clothes and fish nets.

Bitag (*Calophyllum inophyllum* Linn.) (9, p. 260) or *palo maria de la playa*, is widely distributed throughout the Philippines along seashores and banks of streams at low and medium altitudes. A fair number is growing in Bataan, Zambales, and Mindoro Provinces. The tree is large and reaches a diameter of 130 centimeters.

Kalumpit (*Terminalia edulis* Blanco) (9, p. 371) is widely distributed from Northern Luzon to Mindanao and Palawan, in most provinces and islands in the more open portions of the dipterocarp forests at low and medium altitudes. It is not abundant anywhere. It is a large tree that reaches a diameter of 100 centimeters.

Kariskis [*Albizia lebbekoides* (DC) Benth.] (9, p. 115) is a small tree widely distributed throughout the Philippines at low and medium altitudes.

b. The solid extracts were prepared in our laboratory from the kernels of green betel-nut fruits obtained from Los Baños, Laguna Province, and from the bark of black wattle grown at the Philippine Bureau of Forestry Experimental Station in Bukidnon Province, Mindanao.

Betel palm (*Areca catechu*), (4) known in the Philippines as *boñga*, *buñga*, or *luyos*, usually reaches a height of 40 to 100 feet and a circumference of about 20 inches. The fruit is 1.5 to 2 inches long, smooth, and orange or scarlet when ripe. This palm is cultivated within the moist tropical tracts along the coast of eastern and western Bengal, India, and in some portions of Assam and Ceylon. It has been cultivated extensively in all parts of the East Indies and found growing wild in some parts of the Philippines and Sumatra.

The palm bears fruit throughout the year. Flowers form in January and March, and the fruits ripen in October, December, and January. A tree usually bears fruit at the age of 6 to 7 years. Each tree produces two bunches of fruits and sometimes three or four. A good bunch gives 200 to 300 nuts.

The nut, together with betel pepper leaf and lime, is used for chewing. Medicinally it is used as an astringent, especially for diarrhœa. In some parts of India it is used for dyeing cotton cloth. It is also used as a vermifuge.

The black wattle (*Acacia decurrens*) (2) bark used in the preparation of the tanning extract was obtained from trees grown in Bukidnon Province, Mindanao. The trees growing at sitio Kaatoan reached an average height of 5.29 meters at the age of about 4 years. These trees were grown from seeds obtained from the Forest Research Institute, Buitenzorg, Java.

c. Kamachile and *bakauan* extracts were obtained from the Philippine Cutch Corporation in Zamboanga city.

Kamachile [*Pithecolobium dulce* (Roxb.) Benth.] (5, p. 293) is a tree 5 to 8 meters high. It is a native of tropical America but is now thoroughly naturalized in the Philippines. It is common and widely distributed.

Bakauan (*Rhizophora candelaria* DC) (9, p. 361) grows abundantly throughout the Philippine swamps. It occupies nearly a dominant role in littoral forests. It is planted in the swamps of Rizal, Bulacan, Pampanga, and Bataan Provinces, where there are fish ponds, for wind breaks and for protection against sea waves. The tree usually reaches a diameter of 50 centimeters.

d. Bunot extract is an alkaline liquid that was obtained in the Bureau of Science as a by-product in the preparation of wall boards from coconut husk. Bunot contains more dye than tannin.

Coconut (*Cocos nucifera* Linn.) (5, p. 93) is the most abundant and most valuable palm in the Philippines. It is cultivated in most parts of the Islands for copra or coconut oil. It thrives well on the seashore and in places where there is an equal distribution of rain throughout the year. The husk of the fruits is used for ropes, hats, mats, brushes, and brooms.

The American tanning materials were standard products imported from American companies as shown in Table 1.

TABLE 1.—Materials used for diffusion experiments.

Sample.	Name.		Nature of sample.	Source.
	Common.	Scientific.		
a 1	Tanolin.....	-----	Chrome (solid)	Martin Dennis, New Jersey.
b 2	Anabiong.....	<i>Trema orientalis</i> (Linn.) Bl.	Solution from bark.	Los Baños, Laguna, Philippines.
b 3	Bitao.....	<i>Calophyllum inophyllum</i> Linn.	-----do-----	Do.
b 4	Kalumpit.....	<i>Terminalia edulis</i> Blco.	-----do-----	Do.
b 5	Kariakis.....	<i>Albizzia lebbekoides</i> (DC) Benth.	-----do-----	Do.
b 6	Bunot—coco- nut husk.	<i>Cocos nucifera</i>	Liquid extract	Bureau of Science, Manila.
b 7	Kamachile.....	<i>Pithecolobium dulce</i> (Roxb.) Benth.	Solid extract..	Philippine Cutch Corporation, Zamboanga, Philippines.
b 8	Cutch—baka- uan	<i>Rhizophora candelaria</i> DC	-----do-----	Do.
b 9	Betel nut.....	<i>Areca catechu</i>	-----do-----	Bureau of Science, Manila.
b 10	Black wattle.....	<i>Acacia decurrens</i> Willd.	-----do-----	Do.
c 11	Do.....	-----do-----	-----do-----	The Tannin Corporation, New York, New York.
c 12	Quebracho.....	<i>Quebrachia lorzentzii</i>	-----do-----	Do.
c 13	Mytan—my- robalan.	<i>Terminalia chebula</i>	Semisolid ex- tract.	Do.
c 14	Valonex—va- lonia.	<i>Quercus aegilops</i>	Solid extract..	Do.
c 15	Hemlock.....	<i>Tsuga canadensis</i>	Powdered ex- tract.	Mead Paperboard Corporation, Lynchburg, Virginia.
c 16	Red oak.....	<i>Quercus rubra</i>	-----do-----	Do.
c 17	Chestnut.....	<i>Castanea dentata</i>	Solid extract..	The Champion Paper & Fiber Co., Hamilton, Ohio.

a An imported chrome preparation.

b Philippine vegetable tanning materials.

c Imported vegetable tanning materials.

These imported extracts⁽¹⁵⁾ are usually prepared from the barks of black wattle (*Acacia decurrens*); hemlock (*Tsuga canadensis*); and chestnut (*Castanea dentata*); from the wood of quebracho (*Quebrachia lorzentzii*); from the nuts of myrobalan (*Terminalia chebula*); from the acorns of valonia (*Quercus aegilops*); and from the twig galls of red oak (*Quercus rubra*).

According to Rogers⁽¹⁰⁾ hemlock is an excellent tanning material, and probably the only one that could possibly produce excellent leather of all kinds. It is well suited for the lightest colored fancy or upper leather as well as for the heaviest soles.

Chestnut has been used extensively in the manufacture of sole, belting, and other heavy leathers. Properly prepared and used, it can also be employed for many other classes of leather.

Quebracho is employed for all classes of leather. When clarified it is especially suited for the tannage of light leathers,

where weight and plumpness are not considered. Combined with hemlock and oak, it is extensively used in the manufacture of bag, case, patent, and automobile leather. For heavy leather, such as sole, belting, and harness, quebracho, used alone, is not a good tanning material, because it does not contain the necessary sugars for acid-forming which is essential for this particular tannage. When used alone it does not make solid leather of good weight.

Table 2 gives the analyses of these materials in accordance with the official methods of the American Leather Chemists Association.

TABLE 2.—Analyses of materials.*

Sample.	Common name.	Tannin.	Nontan- nin.	Solids.		
				Total.	Soluble.	Insoluble.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
b 1	Tanolin.....					
c 2	Anabiong.....	11.72	11.88	29.37	24.60	4.77
d 3	Bitag.....	16.05	4.96	22.68	21.01	1.67
d 4	Kalumpit.....	34.11	7.23	43.17	41.34	1.83
d 5	Kariskis.....	19.70	7.63	28.12	27.33	0.79
e 6	Bunot—coconut husk.....	0.39	1.90	2.30	2.29	0.01
f 7	Kamachile.....	57.45	33.85	92.88	91.30	1.58
f 8	Cutch—bakauan.....	62.70	28.30	92.36	91.00	1.36
f 9	Betel nut.....	56.88	28.20	98.43	85.08	13.35
f 10	Black wattle.....	67.37	17.42	88.02	84.79	3.23
f 11	Do.....	64.93	19.43	84.59	84.36	0.23
f 12	Quebracho.....	67.21	17.10	90.64	84.31	6.33
f 13	Mytan—myrobalan.....	45.00	26.69	80.95	71.69	9.26
f 14	Valonex—valonia.....	59.13	29.39	90.90	88.52	2.38
f 15	Hemlock.....	58.37	27.80	89.90	85.17	4.73
f 16	Red oak.....	46.91	35.80	87.82	82.71	5.11
f 17	Chestnut.....	59.74	26.38	88.39	86.12	2.27

* All of the samples in this table except sample 1 (tanolin) are vegetable tanning materials analysed according to the methods of the American Leather Chemists Association.

^b Contained 12 per cent of moisture; 38.6 per cent of SO₂; 3.9 per cent of Al₂O₃; 7.9 per cent of Na₂O; and 23 per cent of Cr₂O₃ (26 per cent dry basis).

^c Analyzed in our laboratory and the results computed on a dry basis.

^d From Baens, L., F. M. Yenke, and A. P. West. Tannin contents of Philippine barks and wood. Philip. Journ. Sci. 55 (1934) 180.

^e Computed on the volume of the sample.

^f Computed on a wet basis.

Gelatin was used for the diffusion experiments, and the jelly was prepared according to the procedures of Thomas(12) and of Wilson and Kern.(16)

A 10 per cent dispersion of gelatin in a warm 0.2 M tartaric-acid solution was prepared, and 0.2 per cent crystallized ferric chloride dissolved in the dispersion. Portions of this gelatin dispersion (10 cc each) were measured into separate

sets of test tubes. Different amounts of sodium hydroxide (0.5 N) solution were added to each set of test tubes, and the dispersions diluted with distilled water so that each tube contained 5 per cent of gelatin and 0.1 per cent of ferric chloride. In this way gelatin jellies of different pH values were prepared. The tubes were placed in a refrigerator, and after one week, one tube from each set was allowed to stand for about one hour at room temperature, and the pH determined with the glass electrode.

Solutions of the tanning extracts containing equal amounts of total solids and having pH corresponding to those of the different jelly tubes were prepared as follows: Solutions containing 2 per cent total solids were first prepared and 10-cc portions of these poured into glass-stoppered bottles. Different quantities of tartaric acid (0.2 M) or sodium hydroxide (0.5 N) were added to each bottle in order to make pH values approximately equal to those of the gelatin tubes. The solutions were then diluted with water so that the final solutions contained 1 per cent of total solids. After a week the pH values of these solutions were determined.

Five cc of these tan solutions having definite pH values were poured into the solid gelatin tubes which had the corresponding pH values. The depths of penetration of the tan liquor into the gelatin jelly, as indicated by the end of the dark zones (brown, violet, or blue), were recorded at various intervals (7, 16, 25, 38, and 48 days).

DISCUSSION OF RESULTS

Tables 3 to 19 show the extent of diffusion of the different tanning materials in gelatin jelly at different pH values and at different periods of contact between tan liquor and gelatin jelly. In all these tables column 1 gives the number of the sample corresponding to the pH used; column 2 gives the pH of the gelatin jelly in the test tubes; column 3 gives the pH of the tannin solution before contact with the gelatin jelly. Columns 4, 5, 6, 7, and 8 give the depths of penetration of the liquor into the gelatin jelly after 7, 16, 25, 38, and 48 days respectively.

The relation between the extent of diffusion and the pH of the tanning extract after 7 days is shown in text figs. 1 to 4; after 16 days in text figs. 5 to 8; and after 48 days in text figs. 9 to 12.

Tables 3 to 19 and text figs. 1 to 12 show that the different tans studied have their characteristic rates of diffusion at different pH values and after different periods of contact between the gelatin jelly and the tan liquor.

Hoppenstedt,(8) working with some vegetable tans, noted the order of increasing rate of diffusion among his tanning extracts as follows: Mangrove bark < quebracho < hemlock bark < algarobilla < valonia < oak bark < myrobalan < chestnut wood

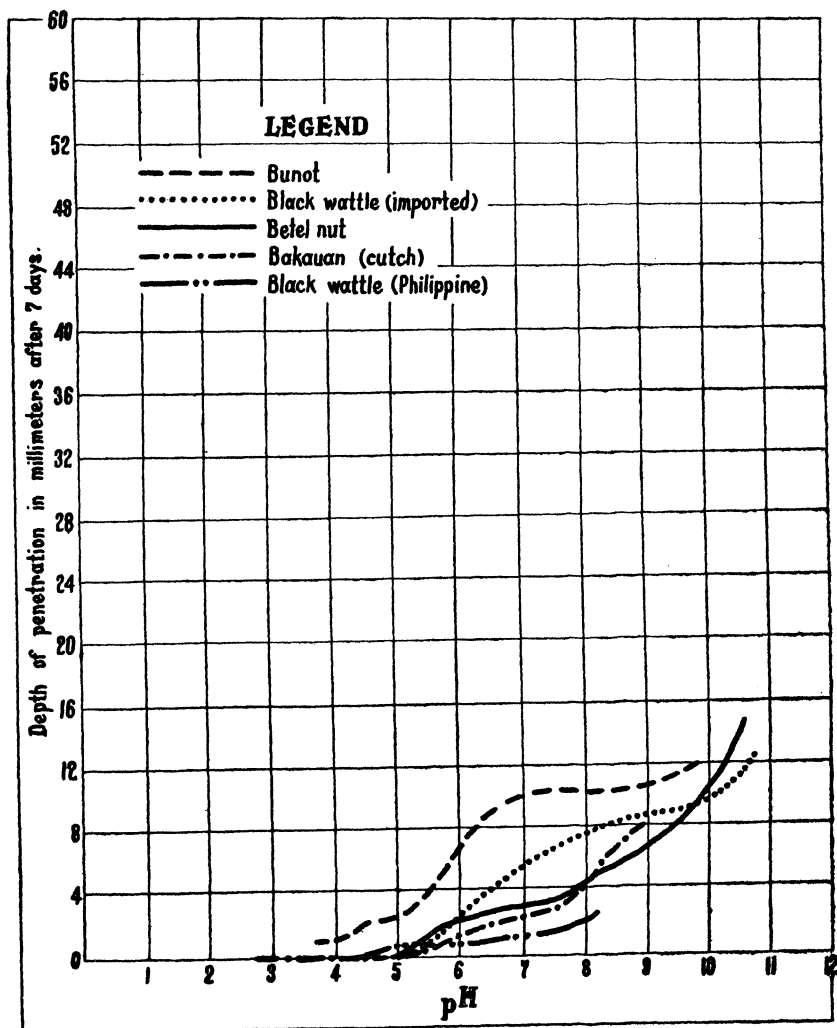


FIG. 1. Penetration of bunot, imported black wattle, betel nut, bakauan (cutch), and Philippine black wattle tanning extracts in 7 days with increasing pH.

< gambier < divi-divi < sumac. Thus mangrove bark gave the lowest rate of diffusion while sumac gave the highest.

Working with another set of vegetable tans, and considering that, since tannins react with gelatin to form insoluble com-

pounds, while nontans do not, a comparative measure of the content of nontannins in extracts could be indicated by their diffusion in gelatin jelly, Thomas(12) showed that the order of diffusion of the nontannins used by him is as follows:

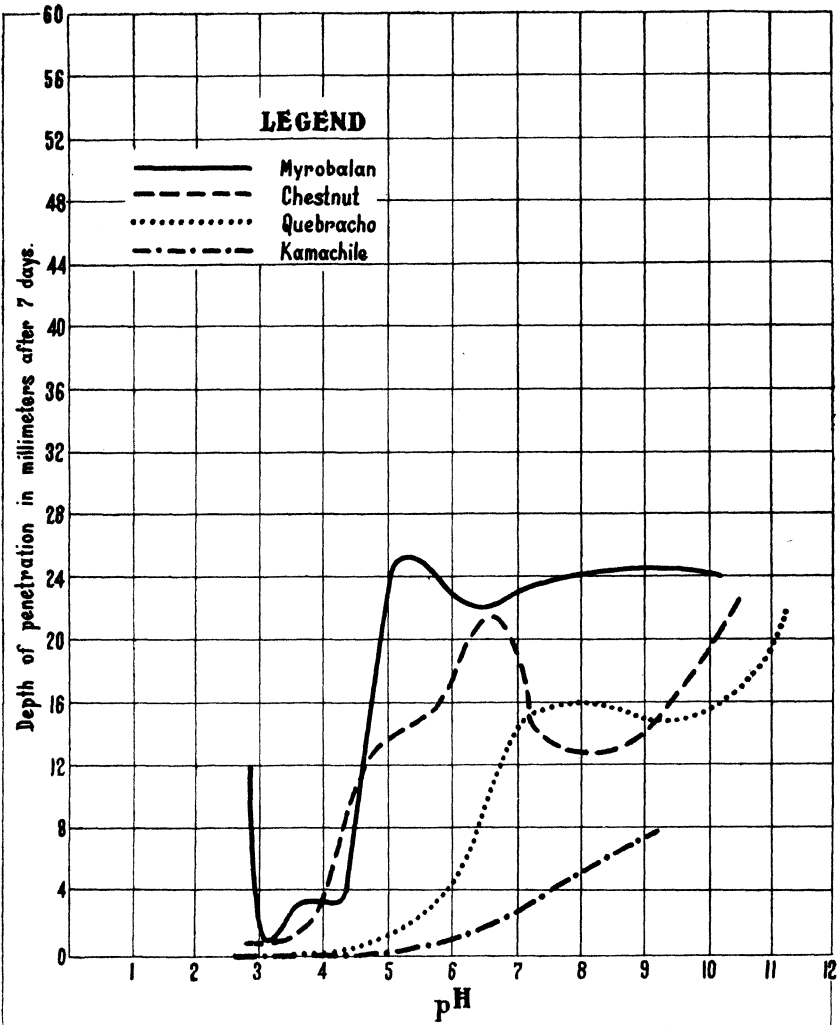


FIG. 2. Penetration of myrobalan, chestnut, quebracho, and kamachile tanning extracts in 7 days with increasing pH.

Osage orange <quebracho <hemlock bark <larch bark <oak bark <chestnut wood <gambier <sumac. The nontans in osage orange gave the lowest diffusion while those in sumac gave the highest.

Thomas observed that the rate of diffusion of tanning extracts into gelatin jelly is generally greater the greater the ratio of nontanin to tannin in the extract; also that the order for the increasing rate of diffusion is the same for the decreasing astrin-

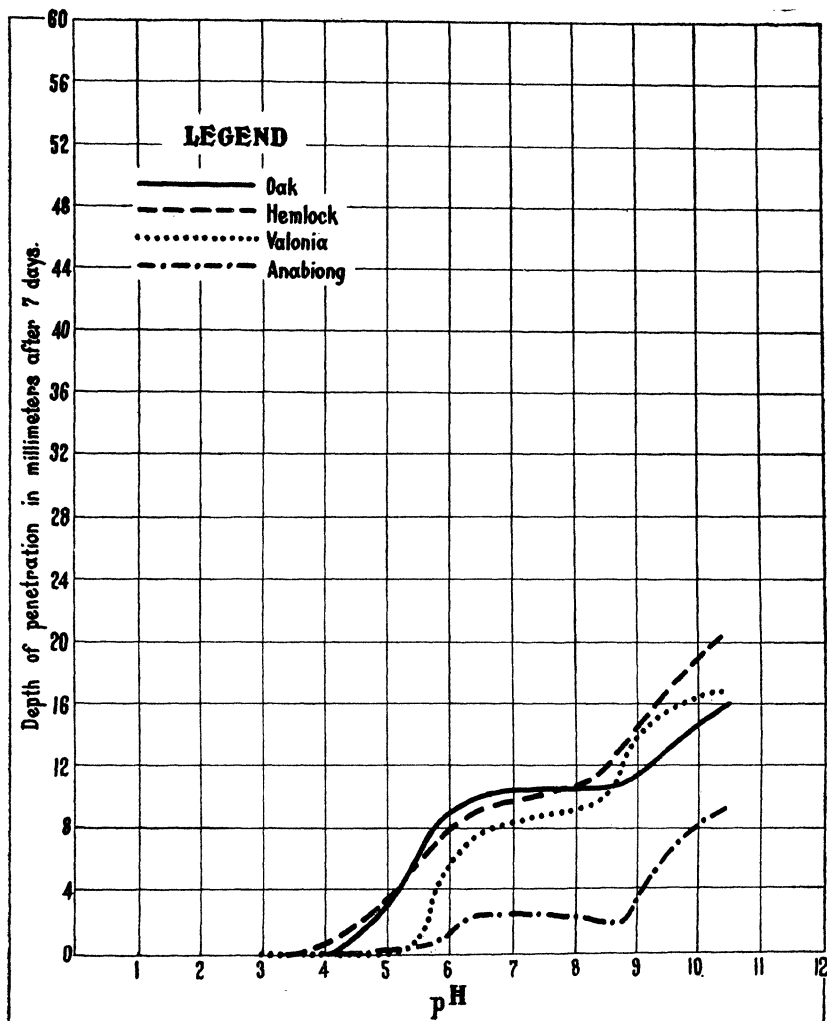


FIG. 3. Penetration of oak, hemlock, valonia, and anabiong tanning extracts in 7 days with increasing pH.

gency or rate of combination of the hide and tanning material. As explained by Wilson and Kern, tannins and nontannins both form compounds with hide substance. But tannins not only have high molecular weights and are, therefore, slow-moving, but they also form stable compounds with hide substance; while nontan-

nins have low molecular weights and, therefore, move faster, and form highly dissociated compounds with hide substance. Hence tannins that would otherwise have combined with hide sub-

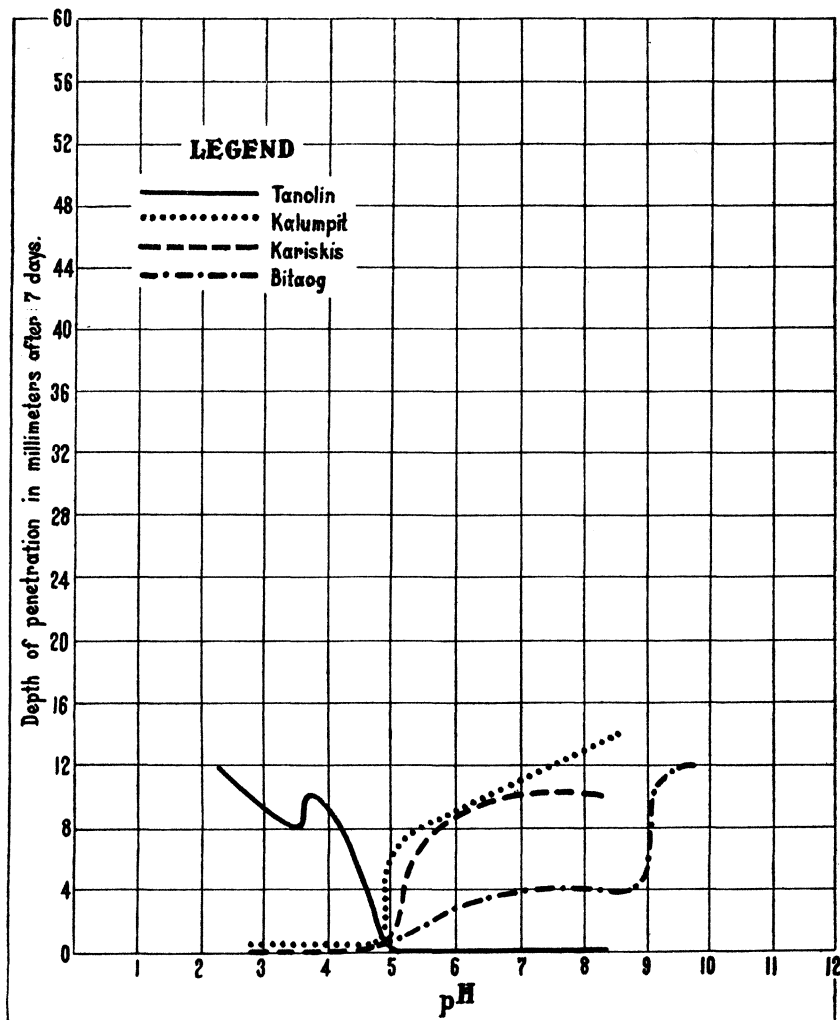


FIG. 4. Penetration of tanolin, kalumpit, kariskis, and bitaog tanning extracts in 7 days with increasing pH.

stance near the surface of the hide could not do so because of the previous occupation of this space by nontannins. In this way the tannins are enabled to proceed into the interior of the hide with an increased rate of penetration.

Furthermore, Wilson and Kern predicted that on the basis of the Procter-Wilson theory of vegetable tanning⁽¹³⁾ both the

tannin and nontannin constituents would penetrate hide substance more rapidly if the acidity of the tan liquor is brought

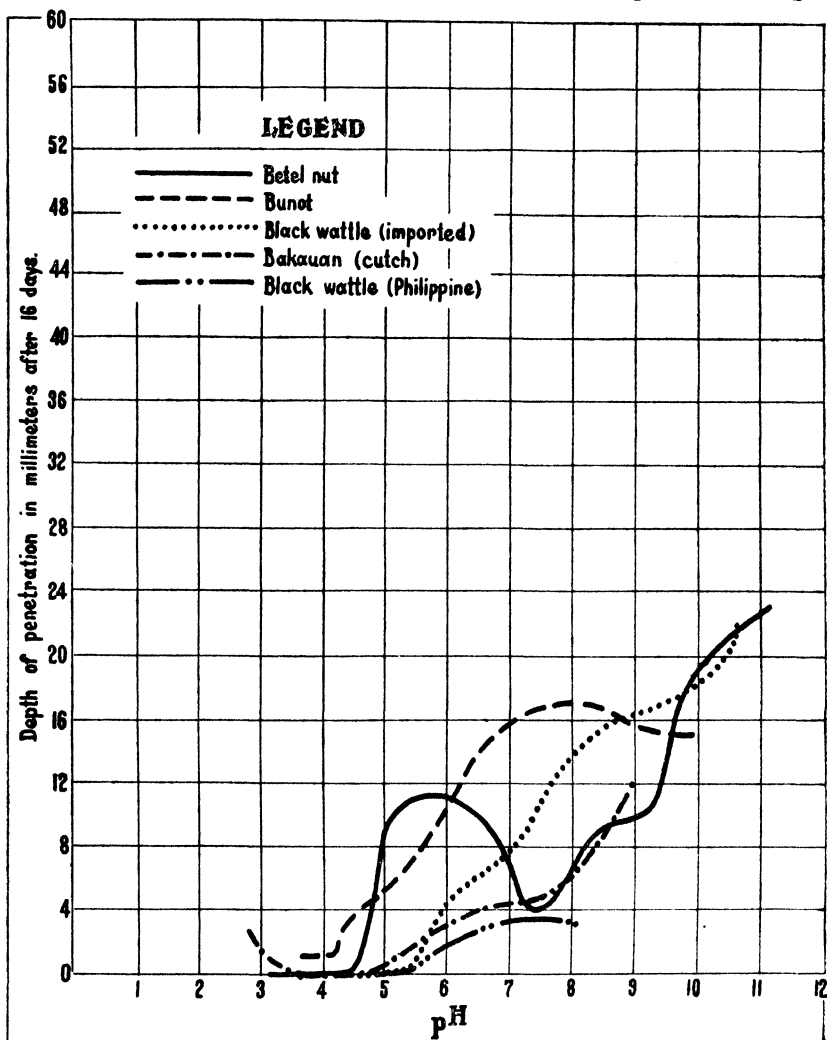


FIG. 5. Penetration of betel-nut, bunot, imported black-wattle, bakauan (cutch), and Philippine black-wattle tanning extracts in 16 days with increasing pH.

to the isoelectric point of the hide substance, and they showed that the rate of penetration is definitely a function of the pH of the tan liquor and the gelatin jelly.

In tanning practice, in general, if the pH of a vegetable tan liquor goes above 5, the yield of leather is low and the leather is colored. On the other hand, if the pH of the liquor goes below 3 with the use of free acids, the liquor astringency is

greatly increased, the tannins are fixed rapidly in the surface, and their rate of penetration is decreased. Furthermore, the

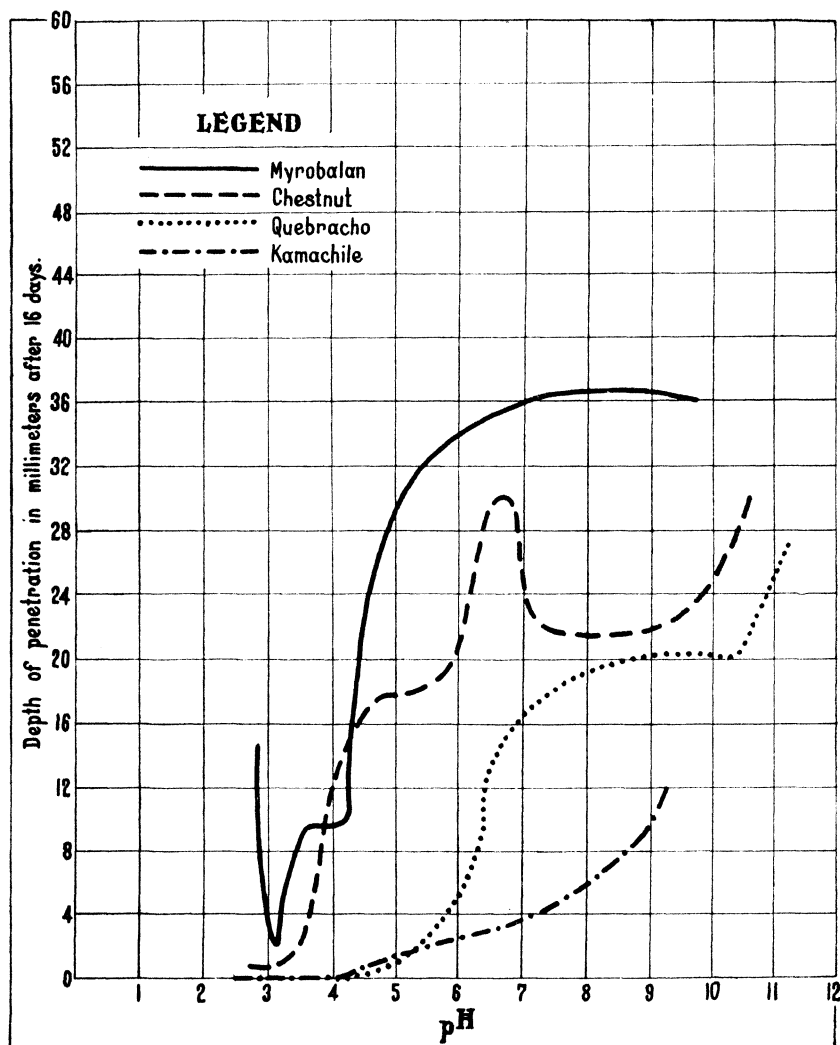


FIG. 6. Penetration of myrobalan, chestnut, quebracho, and kamachile tanning extracts in 16 days with increasing pH.

diffusion of the free acid into the middle of the skin produces swelling and distortion of the skin, which are harmful to the finished leather. For this reason syntans are used in conjunction with the astringent vegetable tans in order that their astringency may be decreased and their rate of penetration increased.

For purposes of comparison, therefore, we have classified the tans studied by their rates of diffusion at pH below 3, at the pH range 3 to 5, and at pH above 5. Table 20 shows this classification. It will be noted that among these tans only my-

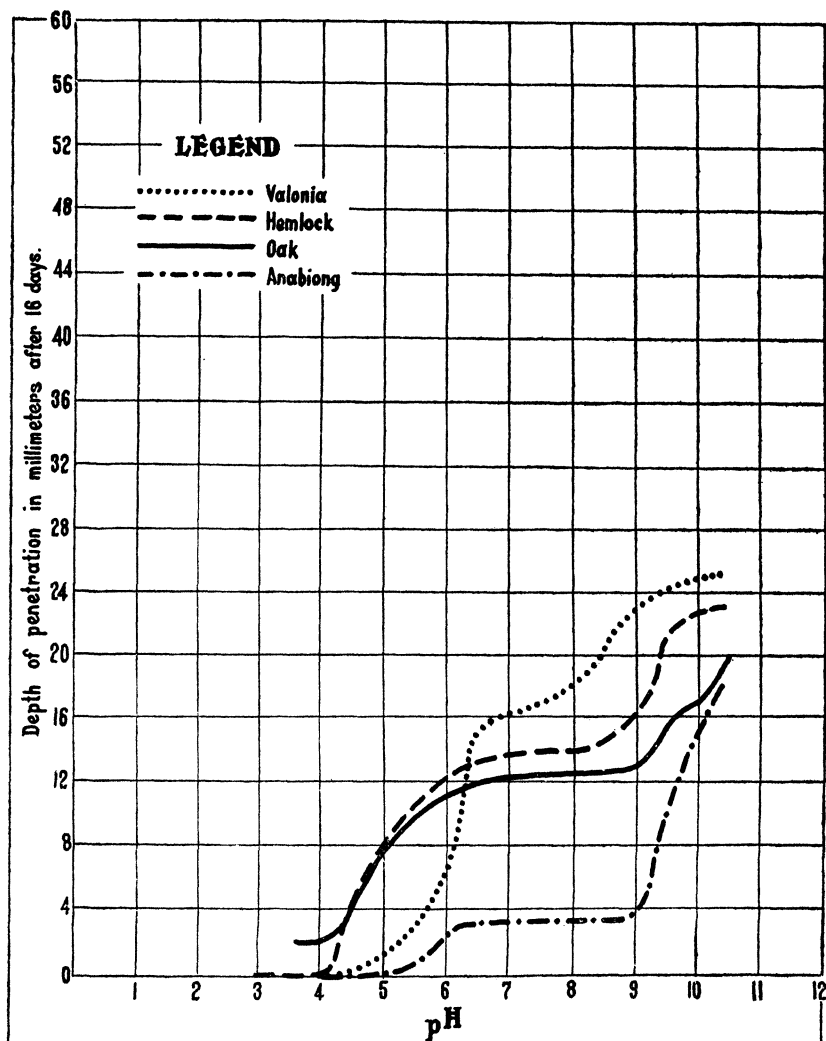


FIG. 7. Penetration of valonia, hemlock, oak, and anabiong tanning extracts in 16 days with increasing pH.

robalan, chestnut, and tanolin show penetration in gelatin jelly after 7 days' contact, when the pH is below 3; cutch, kalumpit, and hemlock show penetration below this pH only after 7 days. The similarity of conditions on the acid range for the utilization

of the vegetable tan, myrobalan, and the chrome tan, tanolin, is very evident.

On the other hand, above pH 5 all of these tans, with the exception of the mineral tanolin, show some degree of penetra-

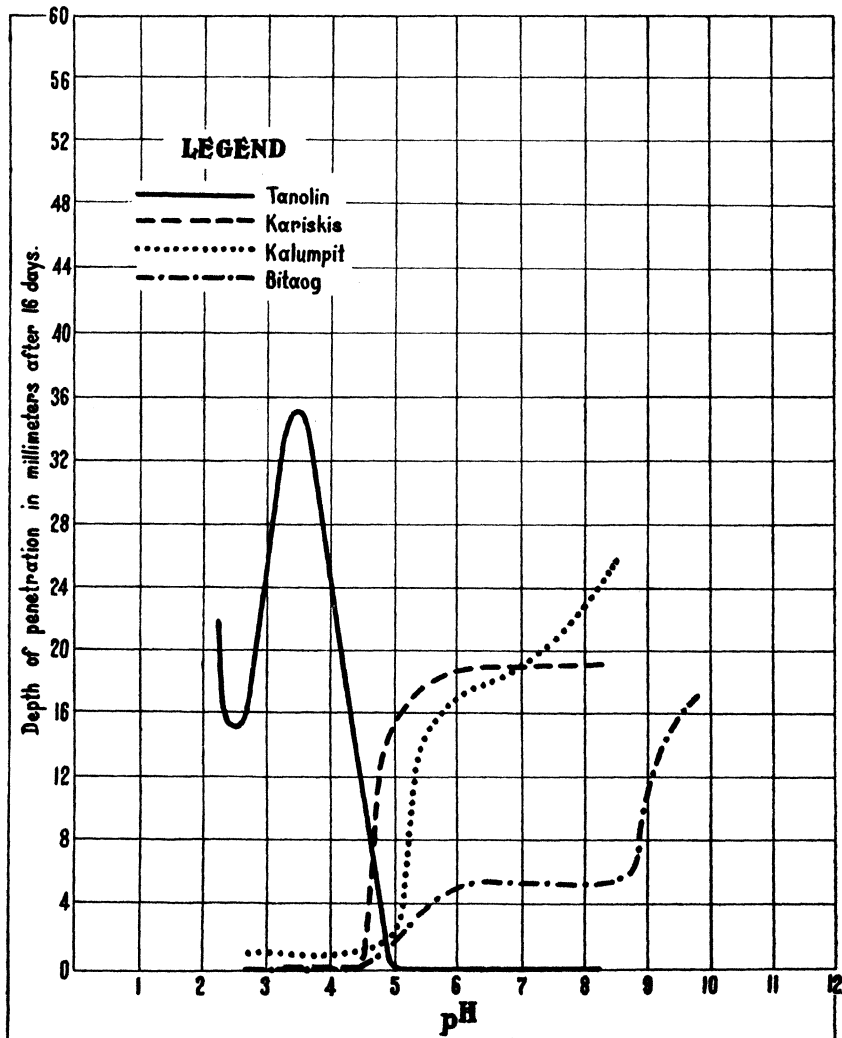


FIG. 8. Penetration of tanolin, kariskis, kalumpit, and bitaog tanning extracts in 16 days with increasing pH.

tion, starting with the most astringent, Philippine black wattle, kamachile, cutch, and the like, and ending with the least astringent, myrobalan and chestnut.

At the pH range 3 to 5, Philippine black wattle, kamachile, cutch, anabiong, imported black wattle, and bitaog show no

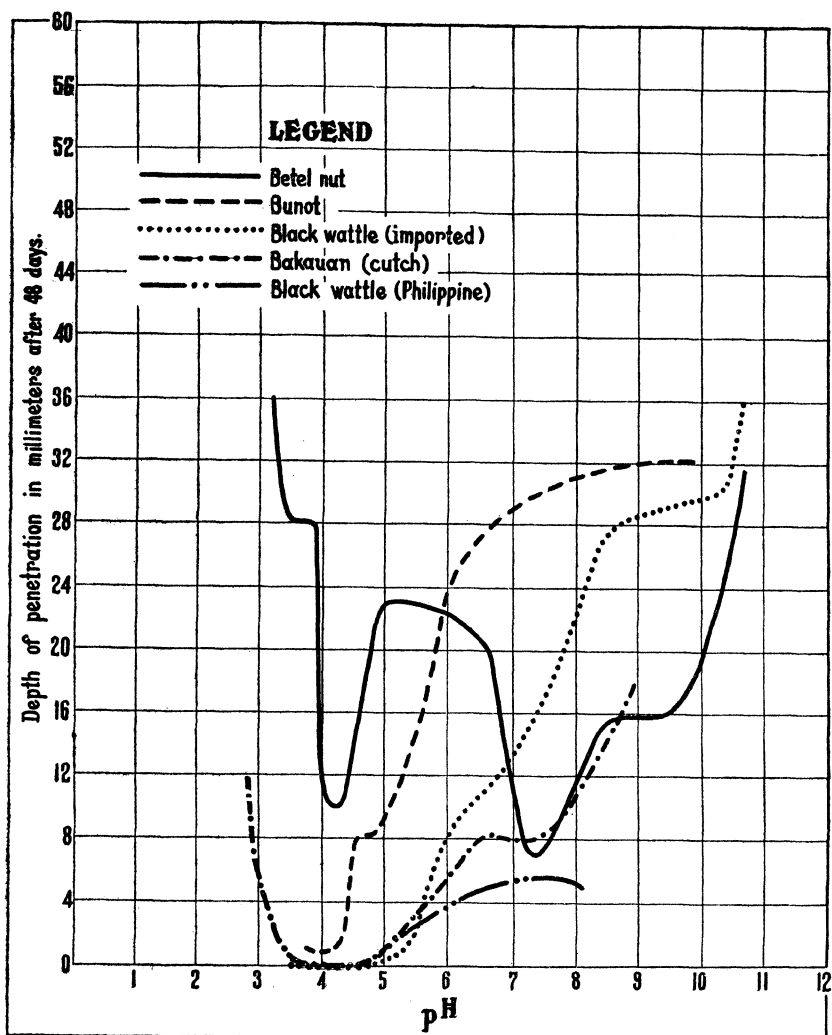


FIG. 9. Penetration of betel nut, bunot, imported black-wattle, bakauan (cutch), and Philippine black-wattle in 48 days with increasing pH.

penetration even after 48 days; while betel nut, quebracho, valonia, kalumpit, hemlock, bunot, kariskis and oak show little penetration, if any, after 7 days, and a greater degree of penetration only after 48 days. Oak, myrobalan, and chestnut show some penetration after 7 days, and a much greater penetration after 48 days.

Taking all these rates of diffusion at different pH ranges into consideration, the order of increasing rate of diffusion of these

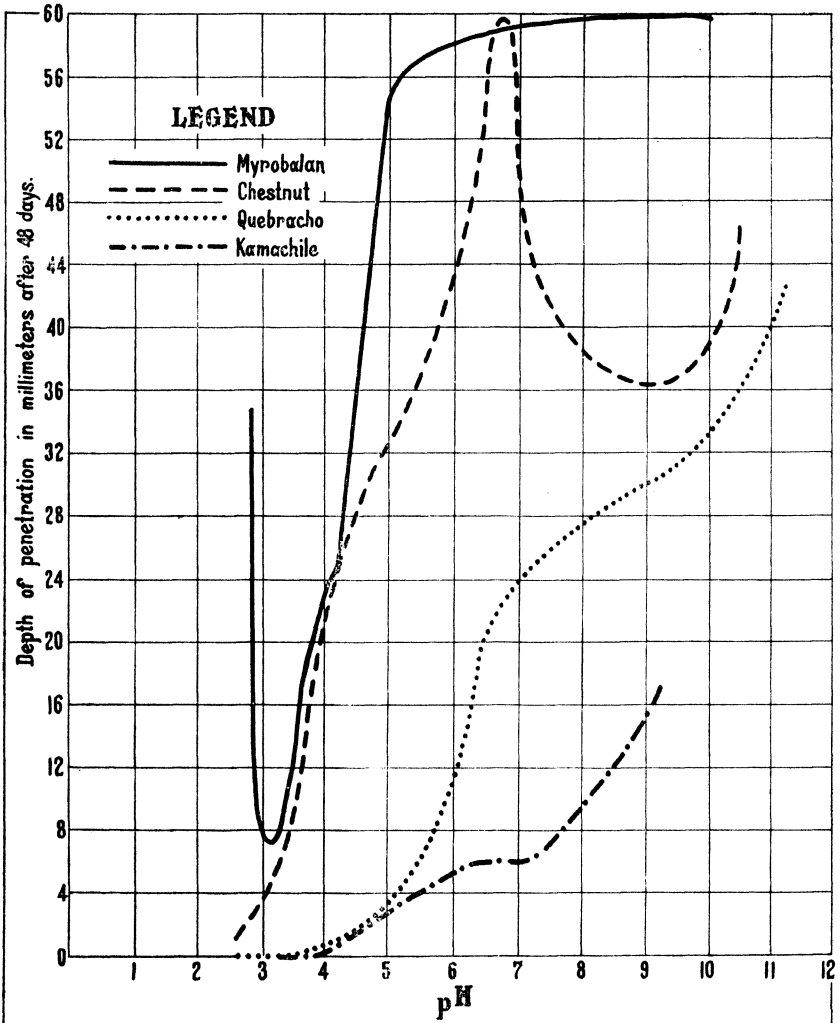


FIG. 10. Penetration of myrobalan, chestnut, quebracho, and kamachile tanning extracts in 48 days with increasing pH.

different tans into gelatin jelly is arranged and given in the last column in Table 20. The Hoppenstedt and Thomas values are included for comparison. Hoppenstedt's and Thomas's orders are identical insofar as they use the same tans, and our order is identical with that of Hoppenstedt, except in the positions of valonia and hemlock, which are reversed in our case. Moreover, Philippine black wattle, kamachile, cutch, anabiong, imported black wattle, and bitaog all come before quebracho;

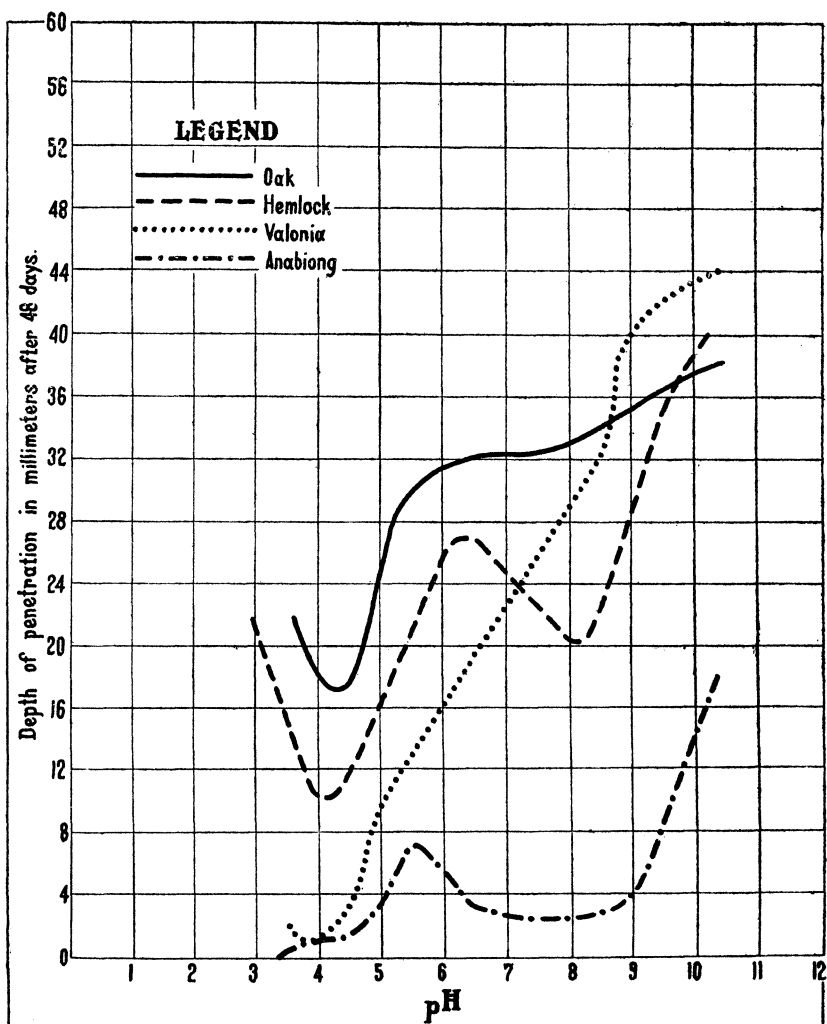


FIG. 11. Penetration of oak, hemlock, valonia, and anabiong tanning extracts in 48 days with increasing pH.

kalumpit comes after valonia and before hemlock; and bunot, kariskis, and betel nut come after hemlock and before oak.

Betel-nut tan extract, in practical tanning with calf skin, yields a very light-colored and soft leather adapted to the manufacture of uppers. Its diffusion characteristics show great similarity with those of oak and hemlock, although it is below imported black wattle after 7 days and above it only after 16 days. The same may be said, to a certain extent, in the case of kariskis and bunot.

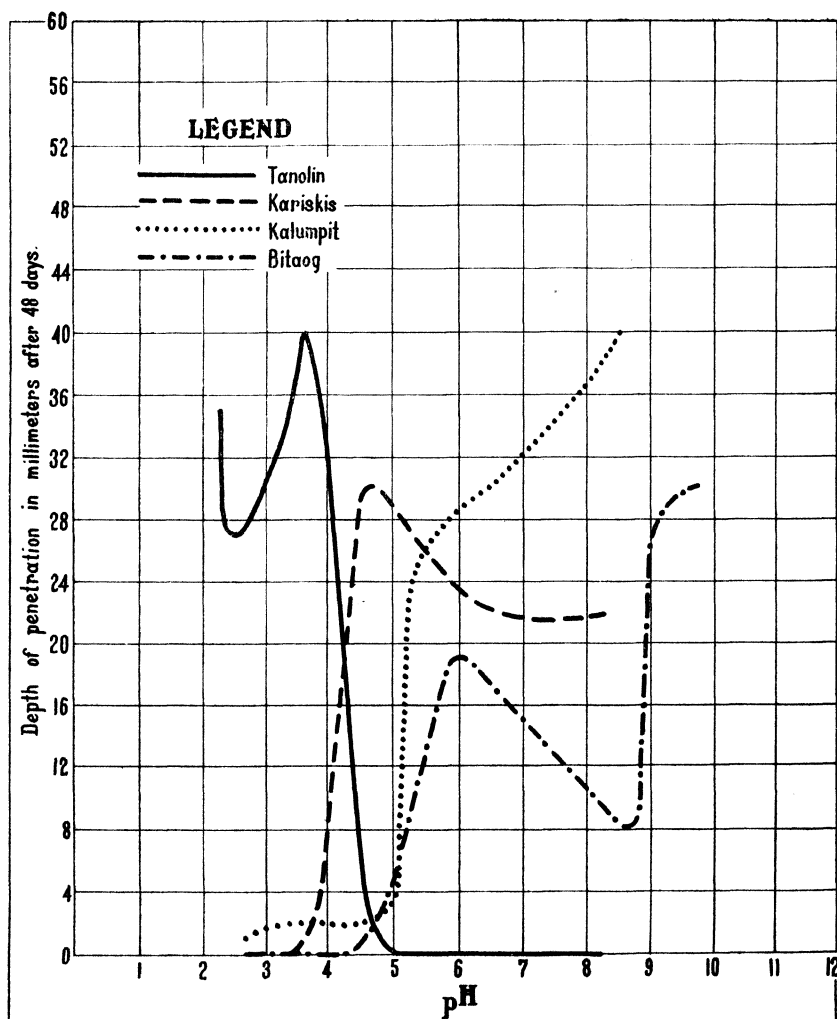


FIG. 12. Penetration of tanolin, kariskis, kalumpit, and bitaog tanning extracts in 48 days with increasing pH.

Comparison of the order of diffusion, as obtained from a classification of the diffusion of the vegetable tans in relation to pH, with the order obtained from the determination of the tannin + nontannin ratios of these tans, shows that there is a great discrepancy between the two, as shown in Table 21. This finding is also in conformity with the observation of Stahler⁽¹¹⁾ who, studying the penetration of chestnut and quebracho tannins into animal hides through an examination of the frozen sections stained with potassium dichromate, found

TABLE 3.—*Diffusion of tanolin solution in gelatin jelly.*

Sample.	pH.		Depth of penetration with days of contact.				
	Gelatin tube.	Tannin solution.	7	16	25	38	48
			mm.	mm.	mm.	mm.	mm.
1.....	2.2	2.3	12	22	30	35	35
2.....	2.5	2.5	11	19	25	27	27
3.....	3.5	3.5	8	35	35	37	37
4.....	3.7	3.7	10	30	35	40	40
5.....	4.2	4.1	8	25	25	30	30
6.....	4.8	5.0	0	0	0	0	0
7.....	5.9	5.7	0	0	0	0	0
8.....	6.3	6.5	0	0	0	0	0
9.....	9.0	8.3	0	0	0	0	0

TABLE 4.—*Diffusion of anabiong tanning extract in gelatin jelly.*

Sample.	pH.		Depth of penetration with days of contact.				
	Gelatin tube.	Tannin solution.	7	16	25	38	48
			mm.	mm.	mm.	mm.	mm.
1.....	3.5	3.4	0	0	0	0	0
2.....	3.9	3.9	0	0	0	0	1
3.....	4.5	4.4	0	0	0	0	1
4.....	5.0	5.6	Slight..	1	2	3	7
5.....	6.5	6.4	2	3	3	3	3
6.....	8.8	8.8	2	3	3	3	3
7.....	9.5	9.3	5	6	6	6	6
8.....	10.4	10.4	9	18	18	18	18

TABLE 5.—*Diffusion of bitaog tanning extract in gelatin jelly.*

Sample.	pH.		Depth of penetration with days of contact.				
	Gelatin tube.	Tannin solution.	7	16	25	38	48
			mm.	mm.	mm.	mm.	mm.
1.....	2.5	2.7	0	0	0	0	0
2.....	3.5	3.3	0	0	0	0	0
3.....	4.5	4.5	0	0	0	0	0
4.....	6.5	6.0	3	5	8	15	19
5.....	8.8	8.8	4	6	8	8	8
6.....	9.5	9.1	10	13	16	27	27
7.....	9.8	9.8	12	17	20	30	30

TABLE 6.—*Diffusion of kalumpit tanning extract in gelatin jelly.*

Sample.	pH.		Depth of penetration with days of contact.				
	Gelatin tube.	Tannin solution.	7	16	25	38	48
			mm.	mm.	mm.	mm.	mm.
1.....	2.5	2.7	slight	1	1	1	1
2.....	3.5	3.3	do	1	2	2	2
3.....	4.5	4.2	do	1	2	2	2
4.....	4.7	4.9	1	2	3	3	3
5.....	5.0	5.3	7	12	15	17	25
6.....	6.5	6.5	10	18	23	26	30
7.....	8.8	8.5	14	26	30	35	40

TABLE 7.—*Diffusion of kariskis tanning extract in gelatin jelly.*

Sample.	pH.		Depth of penetration with days of contact.				
	Gelatin tube.	Tannin solution.	7	16	25	38	48
			mm.	mm.	mm.	mm.	mm.
1.....	2.5	2.8	0	0	0	0	0
2.....	3.5	3.4	0	0	0	0	0
3.....	4.7	4.7	slight	4	14	20	30
4.....	6.5	6.5	10	19	22	22	22
5.....	8.8	8.3	10	19	22	22	22

TABLE 8.—*Diffusion of bunot tanning extract in gelatin jelly.**

Sample.	pH.		Depth of penetration with days of contact.				
	Gelatin tube.	Tannin solution.	7	16	25	38	48
			mm.	mm.	mm.	mm.	mm.
1.....	3.5	3.8	1	1	1	1	1
2.....	4.2	4.3	1	1	1	1	1
3.....	4.6	4.5	2	4	6	6	8
4.....	4.8	4.8	2	5	8	8	8
5.....	5.6	5.6	4	7	10	12	15
6.....	5.9	6.0	6	10	12	17	22
7.....	6.3	6.3	8	12	13	20	25
8.....	6.8	6.7	10	15	20	25	27
9.....	9.0	8.9	10	16	25	30	32
10.....	9.5	9.9	12	15	26	30	32

* The bunot solution, which was alkaline in reaction, was a by product from experiments on the manufacture of wall boards from coconut husk.

TABLE 9.—*Diffusion of kamachile tanning extract in gelatin jelly.*

Sample.	pH.		Depth of penetration with days of contact.				
	Gelatin tube.	Tannin solution.	7	16	25	38	48
			mm.	mm.	mm.	mm.	mm.
1.....	3.1	3.0	0	0	0	0	0
2.....	3.7	3.5	0	0	0	0	0
3.....	4.1	4.0	0	0	0	0	0
4.....	6.5	6.4	1.5	3	5	6	6
5.....	7.4	7.2	3	4	5	6	6
6.....	9.3	9.3	8	12	14	16	17

TABLE 10.—*Diffusion of cutch extract in gelatin jelly.*

Sample.	pH.		Depth of penetration with days of contact.				
	Gelatin tube.	Tannin solution.	7	16	25	38	48
			mm.	mm.	mm.	mm.	mm.
1.....	2.6	2.9	0	3	6	11	12
2.....	3.7	3.5	0	0	0	0	0
3.....	4.7	4.7	0	0	0	0	0
4.....	6.5	6.6	2	4	5	7	8
5.....	7.4	7.6	2.5	5	7	7	8
6.....	9.3	9.0	8	12	14	17	18

TABLE 11.—*Diffusion of betel-nut tanning extract in gelating jelly.**

Sample.	pH.		Depth of penetration with days of contact.				
	Gelatin tube.	Tannin solution.	7	16	25	38	48
			mm.	mm.	mm.	mm.	mm.
1.....	3.1	3.1	0	0	0	30	36
2.....	3.7	3.5	0	0	0	20	28
3.....	4.1	3.8	0	0	0	20	28
4.....	4.5	4.3	0	1	2	5	10
5.....	5.1	5.0	0	10	18	22	23
6.....	6.5	6.6	3	10	12	20	20
7.....	7.4	7.3	3	4	5	6	7
8.....	8.5	8.5	6	9	9	14	15
9.....	9.3	9.5	8	10	13	14	16
10.....	9.8	10.4	12	18	20	22	25
11.....	11.2	10.7	15	23	23	30	32

* The betel-nut extract was prepared in the Bureau of Science from the kernels of green betel fruits gathered in Los Baños, Laguna Province.

TABLE 12.—*Diffusion of Philippine black-wattle tanning extract in gelatin jelly.*^a

Sample.	pH.		Depth of penetration with days of contact.				
	Gelatin tube.	Tannin solution.	7	16	25	38	48
			mm.	mm.	mm.	mm.	mm.
1.....	3.7	3.6	0	0	0	0	0
2.....	4.2	4.0	0	0	0	0	0
3.....	4.6	4.7	0	0	0	0	0
4.....	5.5	5.3	slight	slight	1	1	1
5.....	5.6	5.7	1	1	2	2	3
6.....	6.3	6.1	1	2	3	3	4
7.....	8.9	8.2	2	3	5	5	5

^a The black wattle solid tannin extract was prepared in the Bureau of Science from black wattle grown in Bukidnon Province, Mindanao, by the Philippine Bureau of Forestry.

TABLE 13.—*Diffusion of imported black-wattle tanning extract in gelatin jelly.*

Sample.	pH.		Depth of penetration with days of contact.				
	Gelatin tube.	Tannin solution.	7	16	25	38	48
			mm.	mm.	mm.	mm.	mm.
1.....	3.5	3.6	0	0	0	0	0
2.....	4.2	4.2	0	0	0	0	0
3.....	4.8	4.7	0	0	0	0	0
4.....	5.6	5.4	0	0	slight	slight	1
5.....	6.3	6.2	3	5	7	7	10
6.....	7.5	7.3	6	9	14	16	16
7.....	9.0	8.3	8	15	22	25	27
8.....	10.2	10.4	10	19	24	30	32
9.....	10.8	10.7	13	22	27	32	36

TABLE 14.—*Diffusion of quebracho tanning extract in gelatin jelly.*

Sample.	pH.		Depth of penetration with days of contact.				
	Gelatin tube.	Tannin solution.	7	16	25	38	48
			mm.	mm.	mm.	mm.	mm.
1.....	2.6	2.7	0	0	0	0	0
2.....	3.7	3.6	0	0	0	0	0
3.....	5.1	5.0	1	1	1	2	3
4.....	6.5	6.4	7	10	14	16	19
5.....	7.4	7.1	15	17	20	23	24
6.....	9.3	9.1	15	20	22	26	30
7.....	10.5	10.5	16	20	27	29	35
8.....	11.3	11.3	22	27	31	39	42

TABLE 15.—*Diffusion of myrobalan tanning extract in gelatin jelly.*

Sample.	pH.		Depth of penetration with days of contact.				
	Gelatin tube.	Tannin solution.	7	16	25	38	48
			mm.	mm.	mm.	mm.	mm.
1-----	2.6	2.9	12	15	25	30	35
2-----	3.1	3.1	1	2	3	5	7
3-----	3.7	3.6	3	10	11	13	16
4-----	4.1	4.3	3	10	15	20	25
5-----	5.1	5.1	25	30	40	47	55
6-----	6.5	6.5	22	35	40	47	55
7-----	7.4	7.0	23	36	40	47	55
8-----	9.3	9.8	24	36	44	48	60
9-----	10.5	10.0	24	36	44	49	60

TABLE 16.—*Diffusion of valonia tanning extract in gelatin jelly.*

Sample.	pH.		Depth of penetration with days of contact.				
	Gelatin tube.	Tannin solution.	7	16	25	38	48
			mm.	mm.	mm.	mm.	mm.
1-----	3.5	3.5	0	0	0	1	2
2-----	3.9	3.9	0	0	0	0	1
3-----	4.5	4.5	0	slight	2	3	8
4-----	5.0	5.3	0	2	4	10	11
5-----	6.5	6.4	7	14	15	20	20
6-----	8.8	8.5	10	20	23	30	32
7-----	9.5	9.0	14	23	28	37	40
8-----	10.4	10.5	17	25	35	43	44

TABLE 17.—*Diffusion of hemlock tanning extract in gelatin jelly.*

Sample.	pH.		Depth of penetration with days of contact.				
	Gelatin tube.	Tannin solution.	7	16	25	38	48
			mm.	mm.	mm.	mm.	mm.
1-----	2.5	3.0	0	0	0	4	22
2-----	3.5	3.5	0	0	0	2	15
3-----	4.5	4.2	slight	slight	2	4	10
4-----	6.5	6.4	9	13	17	25	27
5-----	8.8	8.2	11	14	18	20	20
6-----	9.5	9.5	17	21	27	32	35
7-----	10.4	10.3	20	23	30	37	40

TABLE 18.—*Diffusion of red-oak tanning extract in gelatin jelly.*

Sample.	pH.		Depth of penetration with days of contact.				
	Gelatin tube.	Tannin solution.	7	16	25	38	48
			mm.	mm.	mm.	mm.	mm.
1-----	3.5	3.7	0	2	2	13	22
2-----	4.5	4.4	2	3	3	10	17
3-----	5.0	5.6	6	10	20	27	30
4-----	6.5	6.4	10	12	22	28	32
5-----	8.8	9.0	11	13	22	28	35
6-----	9.5	9.4	13	15	24	28	36
7-----	9.8	9.9	14	17	25	30	37
8-----	10.4	10.5	16	20	28	33	38

TABLE 19.—*Diffusion of chestnut tanning extract in gelatin jelly.*

Sample.	pH.		Depth of penetration with days of contact.				
	Gelatin tube.	Tannin solution.	7	16	25	38	48
			mm.	mm.	mm.	mm.	mm.
1-----	2.6	2.7	1	1	1	1	1
2-----	3.1	3.2	1	1	2	4	5
3-----	3.7	3.9	2	8	10	14	16
4-----	4.7	4.9	13	18	21	28	31
5-----	5.1	5.6	15	20	25	32	37
6-----	6.5	6.8	21	30	42	52	60
7-----	7.4	7.2	15	22	30	40	44
8-----	9.3	9.3	15	22	30	33	36
9-----	10.5	10.6	23	30	35	40	47

TABLE 20.—Order of increasing rate of diffusion of different tan liquors.

Tanning extract.	Penetration at pH below 3.		Penetration at pH between 3 and 5.		Penetration at pH above 5.		Penetration range in mm and pH above 5.		Order of increasing rate of diffusion.	
	After 7 days.	After 48 days.	After 7 days.	After 48 days.	After 7 days.	After 48 days.	mm.	pH.	Hoppenstedt.	Thomas.
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	pH.	Relative.	Absolute.
Philippine black wattle.....	---	---	---	---	1-5	1-5	1-5	5.6-8.5	-2	1
Kamachile.....	---	---	0	0	1.5-8	6-17	1.5-17	6.4-9.3	-1	2
Cutch.....	0	12	0	0	2-8	8-18	2-18	6.5-9.1	0	3
Anablong.....	---	---	0	0-1	0-9	7-18	0-18	5.3-10.4	0a	4
Imported black wattle.....	---	---	0	0	0-13	1-36	0-36	5.5-10.7	0b	5
Bitag.....	0	0	0	0	3-12	19-30	3-30	6.2-9.8	0c	6
Quebracho.....	0	0	0-1	0-3	1-22	3-42	1-42	5.0-11.3	1	7
Valonia.....	---	---	0	2-3	0-17	11-44	0-44	5.1-10.4	2	8
Kalumpit.....	0	1	0-1	2-3	7-14	25-40	7-40	5.1-8.6	2a	9
Hemlock.....	0	22	0	15-10	9-20	27-40	9-40	6.4-10.4	3	10
Bunot.....	---	---	1-2	1-8	4-12	15-32	4-32	5.6-9.7	3a	11
Kariakia.....	0	0	0	30	10	22	10-22	6.5-8.5	3b	12
Betel nut.....	---	---	0	36-10	0-15	23-32	0-32	5.0-10.4	3c	13
Red oak.....	---	---	0-2	22-17	6-16	30-38	6-38	5.3-10.4	4	14
Myrobalan.....	12	35	1-3	7-25	25-24	55-60	25-60	5.1-10.2	5	15
Chestnut.....	1	1	1-13	5-31	15-23	37-60	15-60	5.3-10.5	6	16
Tanolin *.....	12-11	35-27	8-0	37-0	0	0	0	4.9-8.6	7	17

* Not a vegetable ton.

that penetration was not changed by increasing the ratio of nontannin to tannin. Although the ratio of nontannins to tannins may determine to a certain extent the rate of diffusion of a given vegetable tan in gelatin jelly, it would seem that the more important consideration in penetration is the pH of both the tanning liquor and of the jelly.

TABLE 21.—*Comparison of orders of increasing rate of diffusion and of increasing nontannin to tannin + nontannin ratio.*

Order as observed in Table 20.	Tanning extract.	Nontannin	Order according to increasing Nontannin ratio.
		Tannin + nontannin.	Tannin + nontannin
1.....	Philippine black wattle.....	0.210	3
2.....	Kamachile.....	0.374	13
3.....	Cutch.....	0.310	9
4.....	Anabiong.....	0.525	15
5.....	Imported black wattle.....	0.230	4
6.....	Bitag.....	0.236	5
7.....	Quebracho.....	0.200	2
8.....	Valonia.....	0.330	11
9.....	Kalumpit.....	0.176	1
10.....	Hemlock.....	0.290	7
11.....	Bunot.....	0.880	16
12.....	Kariskis.....	0.282	6
13.....	Betel nut.....	0.330	10
14.....	Red oak.....	0.430	14
15.....	Myrobalan.....	0.370	12
16.....	Chestnut.....	0.308	8
17.....	Tanolin.....		

SUMMARY

The tanning process consists essentially in treating the hide or skin with something that will penetrate or diffuse into the hide, and later fix or combine chemically with the hide substance (collagen).

Collagen is the principal constituent of hides. In physical properties it resembles gelatin which some consider to be the anhydride of collagen.

Experiments with Philippine and foreign tanning materials were made to determine their comparative diffusion in gelatin jelly.

The Philippine materials consisted of extracts made from the barks of anabiong, bitag, kalumpit, and kariskis; extracts of bunot, kamachile, bakauan, betel nut, and black wattle were also used.

The foreign materials were extracts of quebracho, black wattle, myrobalan, valonia, hemlock, oak, and chestnut. Tanolin was the only chrome tan used.

Generally the vegetable tanning materials diffused faster with an increasing pH value. Tanolin (chrome tan) diffused faster with a decreasing pH value.

Considering the rapidity of the diffusion of tanning materials in gelatin jelly the native black wattle, kamachile, bakauan, and bitaog diffused comparatively slowly. Their diffusion characteristics resemble those of quebracho and they should be good for tanning light leathers where weight and plumpness are not considered.

Kalumpit, like hemlock, diffuses somewhat faster than the materials mentioned above. It may be employed for tanning all kinds of leather, light and heavy.

Extracts of bunot, kariskis, and betel nut should be suitable for preliminary or initial tannage as their diffusion rates are greater than those of kalumpit or hemlock.

In general, the term 'astringency' implies the combining power of a tanning liquor with the hide substance. Extracts that diffuse comparatively slowly have a relatively high astringency. Considering the order of increasing diffusion as an index of decreasing astringency, the extracts that are slowest to diffuse, such as those of native black wattle, kamachile, bakauan, and bitaog may be considered the most astringent; kalumpit is intermediate as regards diffusion or astringency; and bunot, kariskis, and betel nut are the least astringent (fastest to diffuse) of the Philippine vegetable tanning materials studied.

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ILLUSTRATIONS

TEXT FIGURES

[Drawings prepared by Francisco Rafael.]

- FIG. 1. Penetration of bunot, imported black-wattle, betel-nut, bakauan (cutch), and Philippine black-wattle tanning extracts in 7 days with increasing pH.
2. Penetration of myrobalan, chestnut, quebracho, and kamachile tanning extracts in 7 days with increasing pH.
 3. Penetration of oak, hemlock, valonia, and anabiong tanning extracts in 7 days with increasing pH.
 4. Penetration of tanolin, kalumpit, kariskis, and bitaog tanning extracts in 7 days with increasing pH.
 5. Penetration of betel-nut, bunot, imported black-wattle, bakauan (cutch), and Philippine black-wattle tanning extracts in 16 days with increasing pH.
 6. Penetration of myrobalan, chestnut, quebracho, and kamachile tanning extracts in 16 days with increasing pH.
 7. Penetration of valonia, hemlock, oak, and anabiong tanning extracts in 16 days with increasing pH.
 8. Penetration of tanolin, kariskis, kalumpit, and bitaog tanning extracts in 16 days with increasing pH.
 9. Penetration of betel-nut, bunot, imported black-wattle, bakauan (cutch), and Philippine black-wattle tanning extracts in 48 days with increasing pH.
 10. Penetration of myrobalan, chestnut, quebracho, and kamachile tanning extracts in 48 days with increasing pH.
 11. Penetration of oak, hemlock, valonia, and anabiong tanning extracts in 48 days with increasing pH.
 12. Penetration of tanolin, kariskis, kalumpit, and bitaog tanning extracts in 48 days with increasing pH.

THE GENUS CYMBIDIUM IN THE PHILIPPINES

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EIGHT PLATES

The genus *Cymbidium* is small so far as the Philippine flora is concerned. Prior to 1932 only two species, *C. atropurpureum* and *C. Finlaysonianum*, were recognized as occurring in the Philippines. Both are epiphytic and characterized by having very long inflorescences. Ames and Quisumbing¹ added to our flora another species, *C. pubescens*, also epiphytic, but with a short inflorescence. The first discovery of an erect, terrestrial *Cymbidium*, *C. Dayanum*, was reported by Ames and Quisumbing² in 1933.

In the present paper 6 Philippine species are recognized, 2 of which are new to science.

Key to the Philippine species of *Cymbidium*.

1. Plant robust, epiphytic; leaves 2 to 5 cm wide.
 2. Inflorescence very long, 60 to 120 cm long, pendulous; lip glabrous.
 3. Leaves narrow, 2 to 2.5 cm wide; flowers dark purple.
 1. *C. atropurpureum*.
 2. *C. Finlaysonianum*.
 3. Leaves broad, 3 to 5 cm wide; flowers greenish yellow.
 2. Inflorescence short, 15 to 25 cm long, decurved; lip pubescent.
 3. *C. pubescens*.
 1. Plant slender, terrestrial, caespitose; leaves 1.1 to 1.6 cm wide.
 2. Petals and sepals greenish.
 3. Sepals oblong or oblong-ob lanceolate, obtuse..... 4. *C. Gonzalesii*.
 3. Sepals narrowly linear, acute..... 5. *C. Aliciæ*.
 2. Petals and sepals white with crimson stripe at center..6. *C. Dayanum*.

Genus CYMBIDIUM Swartz

1. CYMBIDIUM ATROPURPUREUM (Lindl.) Rolfe. Plate 1, figs. 1 and 2; Plate 4.

Cymbidium atropurpureum (Lindl.) ROLFE, Orch. Rev. 11 (1903) 190;
AMES, Orch. 2 (1908) 218; ibid. 5 (1915) 199; in Merr. Enum.
Philip. Fl. Pl. 1 (1925) 403.

¹ Philip. Journ. Sci. 49 (1932) 491.

² Ibid. 52 (1933) 450.

- Cymbidium pendulum* Sw. var. *atropurpureum* LINDL., Gard. Chron. (1854) 287; Hook. f., Bot. Mag. 94 (1868) t. 5710.
 ? *Cymbidium pendulum* VIDAL, Phan. Cuming. Philip. (1885) 150 pp.; Rev. Pl. Vasc. Filip. (1886) 269 pp., non Sw.
Cymbidium Finlaysonianum Lindl. var. *atropurpureum* VEITCH, Man. Orch. Pl. pt. 9 (1893) 16.
Cymbidium pendulum Sw. var. *purpureum* W. WATS., Orchids ed. 2 (1895) 151, sphalm.

This species was originally described as a var. *atropurpureum* by Lindley. In 1903 Rolfe elevated the var. *atropurpureum* into specific rank. On the basis of Philippine materials examined, particularly living ones, there can be no doubt as to the specific distinction of *Cymbidium atropurpureum* from the common *Cymbidium Finlaysonianum*.

The original description reads as follows:

Var. *atro-purpurea*; sepals petalisque extus flavo-viridibus intus atropurpureis, labelli pallide purpureo-maculati lobo intermedio lateralibus triplo majore recurvo basi dilatato.

Habit of *C. Finlaysonianum*. Stems tufted, stout. Leaves ensiform, 60 to 90 cm long, 2 to 2.5 cm wide, deeply grooved, sheathing and expanded at base, keeled, very leathery, obliquely obtuse. Racemes long, 40 cm to 75 cm, pendulous. Flowers numerous, laxly arranged, 3 to 3.5 cm across. Sheaths membranaceous, up to 7.5 cm long. Bracts minute. Petals and sepals similar in shape and color except petals slightly wider, linear-oblong, narrowed to the obtuse apex, velvety, fleshy, Bordeaux (dark purple), tips of lateral sepals flushed with dull greenish yellow, 2.4 to 2.5 cm long, 5 to 6 mm wide. Labellum recurved, shorter than sepals; lateral lobes small, apex subacute, pale purple (pomegranate purple) 2 to 2.5 mm long; middle lobe broadly oblong-cordate, obtuse, emarginate, sharply decurved, white, tip tinged with rose and with a few purple spots and at the notch bright reddish purple, disc primuline yellow, with two continuous, parallel lamellæ which are divergent at the base. Column Bordeaux, erect, 1.5 cm long. Anther broad, amber yellow. Pollinia ovoid.

LUZON, Benguet Subprovince, Baguio, Mount Mirador, *For. Bur.* 20237 *Sandkuhl*: Rizal Province, Montalban, *Bur. Sci.* 5645 *Schultze*: Manila, cultivated, *Phil. Nat. Herb.* 462 *Quisumbing*. LEYTE, *Wenzel* 103. MINDANAO, Surigao Province, Lake Mainit, *Bur. Sci.* 84157 *Ramos and Convocar*: Davao Province, Malita, *Copeland* 648. It is doubtful that the Baguio and Rizal specimens listed above are natives of those

places; they were probably introduced into those localities as ornamentals.

2. *CYMBIDIUM FINLAYSONIANUM* Lindl. Plate 1, figs. 5 and 6; Plate 3.

Cymbidium Finlaysonianum LINDL. in Wall. Cat. (1832) No. 7358, *nomen*; Gen. & Sp. Orch. Pl. (1833) 164; Hook. f., Fl. Brit. Ind. 6 (1890) 11; VEITCH, Man. Orch. Pl. pt. 9 (1893) 16; RENDLE, Journ. Bot. 39 (1901) 175; J. J. SM., Fl. Buitenz. 6 (Orch. Jav.) (1905) 481; Fig.-Atlas (1911) fig. 366; RIDL., Mat. Fl. Mal. Penin. 1 (1907) 139; AMES, Orch. 2 (1908) 218; *ibid.* 5 (1915) 199; in Merr., Journ. Roy. Asiat. Soc. Straits Branch Special No. (1921) 192; in Merr., Enum. Philip. Fl. Pl. 1 (1925) 403; SCHLTR. in Fedde Repert. 10 (1911) 190; Die Orchideen (1914) 358.

Cymbidium pendulum BLUME, Bijdr. (1825) 379; MIQ., Fl. Ind. Bat. 3 (1859) 707; LINDL., Bot. Reg. 26 (1840) t. 25 (excl. syn.); REICHB. f. in Walp., Ann. 6 (1863) 624, *quoad spec.*; NAVES, Novis. App. (1882) 245; VIDAL, Phan. Cuming. Philip. (1885) 150 pp.; Rev. Pl. Vasc. Filip. (1886) 269 pp.; WARNER & WILL., Orch. Alb. 10 (1893) t. 437 (excl. syn. in part), *non* Sw.

Cymbidium aloifolium LINDL. in Wall., Cat. (1832) No. 7352, A & B; NAVES, Novis. App. (1882) 245; RIDL. in Trans. Linn. Soc. II 3 (1893) 368; Journ. Linn. Soc. 32 (1896) 333; AMES, Orch. 1 (1905) 101; MERR., Philip. Journ. Sci. 1 (1906) Suppl. 39, *non* Sw.

Cymbidium Wallichii LINDL., Gen. & Sp. Orch. Pl. (1833) 165; MIQ., Fl. Ind. Bat. 3 (1859) 707; NAVES, Novis. App. (1882) 245.

Cymbidium pendulum Sw. var. *brevilabre* LINDL., Bot. Reg. 28 (1842) misc. 60; *ibid.* 30 (1844) t. 24; PAXT., Mag. Bot. 11 (1844) 115; REICH. f. in Walp., Ann. 6 (1863) 624.

Cymbidium tricolor MIQ., Choix des Pl. (1864) t. 19.

Epiphytic. Stems short, stout. Leaves ensiform, thick, leathery, 60 to 100 cm long, 3.5 to 5 cm wide, strongly furrowed, obtuse and retuse. Racemes very long, 60 to 140 cm, pendulous. Flowers numerous, loosely arranged, 3.5 to 4 cm across. Petals and sepals subequal. Sepals linear-oblong, 2.6 to 3.5 cm long, 0.8 to 1 mm wide. Petals oblong-elliptic, obtuse, 2.5 to 3 cm long, 0.7 to 0.9 mm wide. Labellum 3-lobed, not saccate; lateral lobes acute, 6 to 8 mm long, rose, streaked with rosolane-purple; middle lobe recurved, suborbicular, 12 to 14 mm long, 10 to 13 mm wide, white, rosolane-purple at notch, barium-yellow at base; the two parallel lamellæ amber-yellow, extending from base of midlobe to base of lip. Column slightly curved, reddish, 1.7 to 1.9 cm long. Another suborbicular, amber-yellow. Fruit obovoid, or oblong-obovoid, 4 to 10 cm long, 3 to 4 cm in diameter.

Throughout the Philippines, from sea level up to 250 meters altitude. Represented by numerous collections from many

provinces in Luzon, Polillo, Bohol, Palawan, Dinagat, Tawi-Tawi, and Mindanao. In Burma, Malay Peninsula, Java, Celebes, Borneo, Sumatra, and Indo-China.

Differs from *C. atropurpureum* in its much longer and wider leaves, larger flowers of dull yellowish green tinted with olive, and in the acute side lobes of the lip.

3. *CYMBIDIUM PUBESCENS* Lindl. Plate 1, figs. 3 and 4; Plate 5.

Cymbidium pubescens LINDL., Bot. Reg. 26 (1840) misc. 75; *ibid.* 27 (1841) t. 38; HOOK, f., Fl. Brit. Ind. 6 (1890) 11; J. J. SM., Fl. Buitenzorg. Orch. Java 6 (1905) 483; Fig.-Atlas (1911) fig. 368; SCHLECHTER, Die Orchideen (1927) 362; AMES & QUIS., Philip. Journ. Sci. 49 (1932) 491, t. 2, figs. 4, 5; t. 8, 21, 22.

Cymbidium aloifolium BLUME, Bijdr. (1825) 378.

Cymbidium bicolor LINDL., (p. p.) Gen. & Sp. Orch. pl. (1833) 164; MIQ., Fl. Ind. Bat. 3 (1859) 707; REICH. f. in Walp., Ann. 6 (1863) 625.

The original description reads as follows:

C. pubescens; foliis ensiformibus striatis apice oblique bidentatis, racemo brevi pendulo, bracteis minimis squamaeformibus, sepalis petalisque linearibus acutiusculis, labelli trilobi basi saccati intus pubescentis laciniis lateralibus acutis intermedia oblonga subundulata obtusa, lamellis rectiusculis medio interruptis.

An epiphyte with much the habit of *Cymbidium atropurpureum* (Lindl.) Rolfe. Leaves clustered, coriaceous, sessile, dark green, ligulate-linear, 50 to 53 cm long, 1.75 to 1.9 cm wide, striated, notch at apex very oblique. Racemes pendulous, 5 to 10-flowered, 15 to 25 cm long; peduncles glabrous, about 11.5 cm long, 4 mm in diameter, clothed at base with 3 tubular sheaths; sheaths light green, basal sheaths shortest, oblong when expanded, acute, about 3 cm long, 2 cm wide, two upper sheaths linear-lanceolate, acute, 4 to 4.5 cm long, about 1.5 cm wide. Floral bracts minute, squamiform, triangular, acute, 2.5 to 3 mm long. Pedicellate ovary 1.3 to 1.5 cm long. Flowers odorless, about 3 cm across. Lateral sepals spreading, narrowly oblong or slightly oblanceolate, acute, slightly oblique, 1.5 to 1.7 cm long, 5 to 5.5 mm wide, 7-nerved. Dorsal sepal similar, erect. Petals spreading, lanceolate or elliptic-lanceolate, acute, 1.4 to 1.55 cm long, 4.75 to 5 mm wide, 5-nerved. Labellum trilobed, suborbicular-ovate in outline when expanded, saccate at base, minutely pubescent on both surfaces, more so within and on margins; lateral lobes semiovate with free apices, short, triangular, porrect, acute, 3 to 3.5 mm long; middle lobe broadly oblong to suborbicular, 7 to 7.5 mm long, 5.5 to 6.25 mm wide, apex rounded, recurved,

apiculate at the very tip; disc with a pair of subparallel fleshy lamellæ or ridges at base in front of which stands another pair of smaller calli. Column long, arcuate, footless, slightly thickened at apex, 10 to 11.5 mm long. Anther semiglobose. Pollinia 2, complanate-pyriform.

LUZON, Manila, Bureau of Science orchid house, *Bur. Sci.* 84547 *Quisumbing*, January 13, 1931. The living plants, which are now in cultivation in Manila, were collected near Butuan, Agusan Province, Mindanao, where they grow on trees at low altitudes. The sepals and petals etruscan-red or acajou-red, broadly edged with deep colonial buff; lateral lobes of labellum ivory-yellow dotted with ox-blood-red. Column pompeian-red; anther light orange-yellow above and amber-brown below.

Lindley³ states—"Although the woods of Singapore have been so often examined by botanists it seems as if the forms of vegetation there were inexhaustible. The species now figured was met with by Mr. Cuming who sent it to Messrs. Loddiges." This species, which is distributed over the Malay Peninsula, Sumatra, Java, Banca, and Siam, *fide* Ridley, doubtless belongs in the group with *C. Finlaysonianum* Lindl. and *C. atropurpureum* (Lindl.) Rolfe. It has the general habit of *C. atropurpureum* and resembles it in the form and size of leaves, but is distinct from both species in having very much shorter racemes, smaller flowers, and a pubescent labellum, as well as in the color of the flowers. *Cymbidium pubescens* Lindl. is reported here for the first time from the Philippines, although several sterile and fruiting specimens in the herbarium of Oakes Ames perhaps represent it. The plant thrives best in orchid pots which contain crushed tuff as a substratum or in wooden baskets. The cymbidiums of the Philippines are among the hardiest of orchids. They even grow luxuriantly perched up on branches of trees.

4. *CYMBIDIUM GONZALESII* Quis. sp. nov. Plate 2, figs. 1 and 2; Plate 6.

Pseudobulbis aggregatis, foliis erectis, 3 ad 4, anguste linearibus, 20 ad 42 cm longis, 1.4 ad 1.6 cm latis. Scapus erectus, ca. 24 cm longus. Sepalis lateralibus oblique oblongo-oblanco-latis, apice obtusis, 2.2 ad 2.8 cm longis, 0.7 ad 0.9 cm latis. Sepalum dorsale oblongum vel oblongo-oblanco-latum, apice obtusum, 2.3 ad 3 cm longum, 0.8 ad 1 cm latum. Petala lineariblonga, apice obtusa 2 ad 2.5 cm longa, 0.7 ad 0.8 cm lata. La-

³ Bot. Reg. 27 (1841) t. 38.

bellum 3-lobatum, subunguiculatum, lobis lateralibus erectis, subrotundatis, brevibus, ca. 2.5 mm longis; intermedio triangulari-ovato, apice obtuso 0.9 ad 1 cm longo, 0.8 ad 0.9 cm lato, basi callis duobus. Columna elongata, subcomplanata, 1.4 ad 1.6 cm longa.

Terrestrial, grasslike in habit, erect. Pseudobulbs of old plants ovoid, approximate, prominent after the leaves die and drop off. Leaves erect, somewhat leathery, dark green, narrowly linear, acute, 20 to 42 cm long, 1.4 to 1.6 cm wide, 5-nerved. Scape erect, few-flowered, about 24 cm tall. Flowers odorless, with spreading sepals, petals spreading after anthesis, 3.5 to 4 cm across. Lateral sepals obliquely oblong-ob lanceolate, obtuse, 2.2 to 2.8 cm long, 0.7 to 0.9 cm wide. Dorsal sepal oblong or oblong-ob lanceolate, obtuse, 2.3 to 3 cm long, 0.8 to 1 cm wide. Petals linear-oblong, obtuse, 2 to 2.5 cm long, 0.7 to 0.8 cm wide. Labellum 3-lobed, subunguiculate; lateral lobes erect, subrounded, short, about 2.5 mm long; middle lobe triangular-ovate, obtuse, 0.9 to 1 cm long, 0.8 to 0.9 cm wide; two prominent lamellæ extending from base of middle lobe to base of labellum. Column elongated, somewhat flattened, 1.4 to 1.6 cm long. Anther cap subquadrate.

LUZON, Manila, Gonzáles's garden, *Phil. Nat. Herb.* 5782 *E. Quisumbing*, July 18, 1938. The living plants were collected from the open grasslands in Rizal Province, at medium altitudes. Petals and sepals light viridine-green, flushed at the tips with viridine-yellow and lined with maroon. Labellum almost white, washed with very faint yellow, lobes barred or spotted with pomegranate-purple, throat citron-yellow, calli empire-yellow. Column citron-yellow.

C. Gonzalesii is somewhat allied to *C. Faberi* Rolfe of China. In general appearance the flowers resemble those of *C. Finlaysonianum*, differing in color and details of the floral parts. Its striking difference lies in its grasslike habit, narrow leaves and erect scapes. This species is dedicated to Mr. José S. Gonzáles, a lover and grower of orchids.

5. CYMBIDIUM ALICIAE Quis. sp. nov. Plate 2, figs. 5 and 6; Plate 7.

Planta parva et gracilis. Folia angusta, lineari-lorata, subcoriacea, 45 ad 60 cm longa; 1.2 ad 1.4 cm lata. Scapus erectus, pauciflorus, 19 ad 20 cm longus. Sepala lateralia angustissime lineari-lanceolata, apice acuminata; 2.5 ad 2.7 cm longa, 3.5 ad 4 mm lata. Sepalum dorsale erectum, anguste lineari-lanceolatum, apice acuminatum, 2.8 ad 3 cm longum, 3 ad

4 mm latum. Petala angustissime lineari-lanceolata, apice acuminata, 2.3 ad 2.5 cm longa, 4.5 ad 5 mm lata. Labellum trilobatum, circiter 20 mm longum; lobi laterales erecti, lati, apiculati, circiter 4 mm longi; lobus medius in positu naturali reflexus expansus triangulari-oblongus, 7 ad 8 mm longus, 5 ad 5.5 mm latus. Columna curvata, subcomplanata, 10 ad 11 mm longa.

Plant terrestrial, erect, acaulescent. Leaves 8 or 10, tufted, subcoriaceous, pale green, curved, elongate, linear, channelled at the base, tapering to the acute apex, 45 to 60 cm long, 1.2 to 1.4 wide. Racemes erect, few-flowered, 19 to 20 cm long; sheaths three, imbricated, 2.4 to 3 cm long, greenish. Pedicellate ovary about 2.5 cm long, greenish purple. Flowers slightly fragrant, 4.5 to 5 cm long, 3 to 3.5 cm across; bracts greenish, subulate, 8 mm long. Lateral sepals spreading, slightly falcate, tips bent backward, narrowly linear-lanceolate, acuminate, 2.5 to 2.7 cm long, 3.5 to 4 mm wide at widest part. Dorsal sepal erect, narrowly linear-lanceolate, apex acuminate, 2.8 to 3 cm long, 3 to 4 mm wide. Petals shorter than sepals, narrowly linear-lanceolate, apex acuminate, 2.3 to 2.5 cm long, 4.5 to 5 mm wide. Labellum 3-lobed; lateral lobes short, broad, apiculate, free portion 4 mm long; middle lobe triangular-oblong, acute, reflexed, 7 to 8 mm long, 5 to 5.5 mm wide; lamellæ two, stout at middle, parallel, glabrous, ending abruptly with the lateral lobes, discontinuous with middle lobe. Column curved, somewhat flattened, 10 to 11 mm long. Anther broadly triangular-ovoid, about 2 mm long.

LUZON, Rizal Province, Baclaran, Mrs. Kenneth B. Day's Garden, *Philip. Nat. Herb.* 400 E. *Quisumbing*, September 18, 1934. Living plants were collected from the mountains of Nueva Vizcaya Province.

The sepals and petals naphthalene-yellow except the tips of sepals which have a very slight tinge of purple. Lateral lobes of labellum rosolane purple; middle lobe white, with a few blotches of pale rosolane-purple; lamellæ chalcedony-yellow. Column and anther pale dull green-yellow.

C. Aliciae is closely allied to *C. cyperifolium* Wall., differing in the details of the flower parts particularly the labellum. In habit it is similar to *C. Aliciae*. It differs in its flowers, particularly the narrowly linear-lanceolate petals and sepals, and in the details of the shape and structure of the labellum. The species is named in honor of Mrs. Kenneth B. Day.

6. *CYMBIDIUM DAYANUM* Reich. f. Plate 2, figs. 3 and 4; Plate 8.

Cymbidium Dayanum REICH. f., Gard. Chron. (1869) 710; Williams' Orch. Grow. Man. ed. 7 (1894) 218; RIDL., Fl. Mal. Penin. 4 (1924) 146; Sanders' Orch. Guide (1927) 138; AMES & QUIS., Philip. Journ. Sci. 52 (1933) 450, t. 1, figs. 7, 8; t. 4, fig. 1; t. 5, figs. 16, 17.

Cymbidium acutum RIDL., Journ. Linn. Soc. 32 (1896) 334; Mat. Fl. Mal. Penin. 1 (1907) 140; SCHLTR., Die Orchideen (1927) 355.

Cymbidium Simonsianum KING and PANTL., Journ. As. Soc. Beng. pt. 2 64 (1895) 338; Ann. Roy. Bot. Gard. Calc. Orch. Sik.-Himal. 8 (1898) 188, t. 250.

The original description reads as follows:

Cymbidium Dayanum, sp. n.

Foliis longissimis (4 pedalis), angustis (vix quartam pollicis latis) coriaceo-pergameneis apice nunc inaequali altero latere acutis, nunc aequaliter, bidentatis, inferne suberosis; racemo plurifloro; vaginis scariosis acutis basi vaginato; rhachi angulata, bracteis triangulis acuminatis ovariiis pedicellatis multo brevioribus, mento subevanido; flore carnosiusculo; sepalis linearibus acuminatis; petalis sublatis brevioribus, labello medio trifido, lacinis lateralibus semiovatis, acutangulis, lacinia media oblongo-triangula acuminata; carinis geminis parallelis approximatis velutinis, usque ad basin laciniarum lateralium altioribus, dein humilibus, ante apicem confluentibus.

Plant terrestrial, grasslike, erect, stemless. Leaves 5 or 6, tufted, subcoriaceous, pale green, elongate-linear, sessile, channelled at base, acute and suboblique at apex, 76.5 to 78.5 cm long, 1.1 to 1.4 cm wide. Racemes erect, about 24 cm long; peduncle about 11 cm long; sheaths at base three or more, imbricated, 1 to 7 cm long, acute, pinkish vinaceous, lowermost sheath nearly white. Pedicellate ovary 1.5 to 3 cm long. Flowers fragrant, about 10, 3.5 to 4.5 cm across; bracts triangular, acute, cucullate, 5 to 8 mm long. Lateral sepals spreading, elliptic-lanceolate or oblanceolate, acute and subfalcate, 2.6 to 2.7 cm long, 7 to 8 mm wide. Dorsal sepal erect, elliptic-lanceolate or oblanceolate, acute, 2.8 to 2.9 cm long, 7 to 7.5 mm wide. Petals smaller than sepals, connivent around column, narrowly elliptic-oblong, acute, apiculate, 2.1 to 2.2 cm long, about 6 mm wide. Labellum 3-lobed, 2 to 2.2 cm long; lateral lobes broadly obtuse, free portion 3 to 3.5 mm long; middle lobe ovate, apiculate, reflexed, 7 to 7.5 mm wide; lamellæ two, stout, parallel, conspicuously pubescent with white glandular hairs, ending abruptly opposite apices of lateral lobes, but continued to middle lobe as raised lines. Column about 12 mm long. Anther broadly triangular ovoid. Pollinia obliquely ovoid, compressed.

LUZON, Baguio, Mrs. Kenneth B. Day's Garden, *Bur. Sci.* 85569 E. *Quisumbing*, October 20, 1931. Living plants originally collected by Mrs. Kenneth B. Day in Baguio, Benguet Sub-province.

The flower are fragrant, the sepals and petals are white with a crimson central line which does not extend to their apices, the labellum is Bordeaux with oblique white and seafoam-yellow lines on the lateral lobes. The column is blackish red-purple, the anther sulphur-yellow. Pedicellate ovary lumiere-green.

Sikkim, Assam, and Perak (Waterloo) at altitudes from 800 to 1,200 meters.

From the other five species of *Cymbidium* known to occur in the Philippines, *Cymbidium Dayanum* is distinguished by its grasslike, tufted leaves and by the color of the flowers.

In habit *Cymbidium Dayanum* is similar to *Cymbidium Gonzalesii* and *Cymbidium Aliciae*, differing, however, in the color of the flower and in the details of the lip and particularly in the conspicuously pubescent lamellæ.



ILLUSTRATIONS

PLATE 1

- FIG. 1. *Cymbidium atropurpureum* (Lindl.) Rolfe; front view of flower, $\times 1$.
 2. *Cymbidium atropurpureum* (Lindl.) Rolfe; side view of flower, $\times 1$.
 3. *Cymbidium pubescens* Lindl.; front view of flower, $\times 1$.
 4. *Cymbidium pubescens* Lindl.; side view of flower, $\times 1$.
 5. *Cymbidium Finlaysonianum* Lindl.; front view of flower, $\times 1$.
 6. *Cymbidium Finlaysonianum* Lindl.; side view of flower, $\times 1$.

PLATE 2

- FIG. 1. *Cymbidium Gonzalesii* Quis. sp. nov.; front view of flower, $\times 1$.
 2. *Cymbidium Gonzalesii* Quis. sp. nov.; side view of flower, $\times 1$.
 3. *Cymbidium Dayanum* Reichb. f.; front view of flower, $\times 1$.
 4. *Cymbidium Dayanum* Reichb. f.; side view of flower, $\times 1$.
 5. *Cymbidium Aliciae* Quis. sp. nov.; front view of flower, $\times 1$.
 6. *Cymbidium Aliciae* Quis. sp. nov.; side view of flower, $\times 1$.

PLATE 3. CYMBIDIUM FINLAYSONIANUM LINDL.

- FIG. 1, habit of plant in flower, very much reduced; 2, front view of flower, $\times 0.66$ (circa); 3, side view of flower, $\times 0.66$ (circa); 4, labellum, stretched out, viewed from above, $\times 0.66$ (circa); 5, front view of column (natural position), $\times 1.33$ (circa); 6, dorsal sepal, $\times 0.66$ (circa); 7, petal, $\times 0.66$ (circa); 8, lateral sepal, $\times 0.66$ (circa); 9, anther, viewed from above, $\times 4$ (circa); 10, anther, viewed from below, $\times 4$ (circa); 11, pollinia, $\times 4$ (circa).

PLATE 4. CYMBIDIUM ATROPURPUREUM (LINDL.) ROLFE

- FIG. 1, dorsal sepal, $\times 1$; 2, petal, $\times 1$; 3, lateral sepal, $\times 1$; 4, front view of column and labellum (natural position), $\times 1.5$; 5, side view of column and labellum, $\times 1.5$; 6, labellum, stretched out, viewed from above, $\times 1.5$; 7, anther, viewed from above, $\times 8$; 8, anther, viewed from below, $\times 8$; 9 and 10, pollinia, $\times 8$.

PLATE 5. CYMBIDIUM PUBESCENS LINDL.

- FIG. 1, dorsal sepal, $\times 1$; 2, petal, $\times 1$; 3, lateral sepal, $\times 1$; 4, front view of column and labellum (natural position), $\times 1.5$; 5, side view of column and labellum (natural position), $\times 1.5$; 6, labellum, stretched out, viewed from above, $\times 1.5$; 7, anther, viewed

from above, $\times 8$; 8, anther, viewed from below, $\times 8$; 9 and 10, pollinia, $\times 8$.

PLATE 6. *CYMBIDIUM GONZALESII* QUIS. SP. NOV.

FIG. 1, habit of a flowering plant, $\times 0.33$ (circa); 2, bract, $\times 3$; 3, dorsal sepal, $\times 1$; 4, petal, $\times 1$; 5, lateral sepal, $\times 1$; 6, side view of flower, $\times 0.66$ (circa); 7, front view of flower, $\times 0.66$ (circa); 8, side view of column and labellum (natural position), $\times 1$; 9, front view of column and labellum (natural position), $\times 1$; 10, labellum, stretched out, viewed from above, $\times 1$; 11, front view of column, $\times 2$; 12, side view of column, $\times 2$; 13, anther, viewed from above, $\times 7$; 14, anther, viewed from below, $\times 7$; 15, pollinia, $\times 7$.

PLATE 7. *CYMBIDIUM ALICIAE* QUIS. SP. NOV.

FIG. 1, habit of a flowering plant, $\times 0.6$ (circa); 2, front view of flower, $\times 1$; 3, side view of flower, $\times 1$; 4, dorsal sepal, $\times 1$; 5, petal sepal, $\times 1$; 6, lateral sepal, stretched out, $\times 1$; 7, lateral sepal (natural position), $\times 1$; 8, front view of column and labellum (natural position), $\times 1.5$; 9, side view of column and labellum (natural position), $\times 1.5$; 10, labellum, stretched out, viewed from above, $\times 1.5$.

PLATE 8. *CYMBIDIUM DAYANUM* REICHB. F.

FIG. 1, dorsal sepal, $\times 1$; 2, petal, $\times 1$; 3, lateral sepal, $\times 1$; 4, side view of flower, $\times 1$; 5, front view of flower, $\times 1$; 6, side view of column and labellum (natural position), $\times 1$; 7, front view of column and labellum (natural position), $\times 1$; 8, stretched out labellum, viewed from above, $\times 1$; 9, anther, viewed from above; $\times 8$; 10, anther, viewed from below, $\times 8$; 11 and 12, pollinia, $\times 8$.



PLATE 1.



PLATE 2.

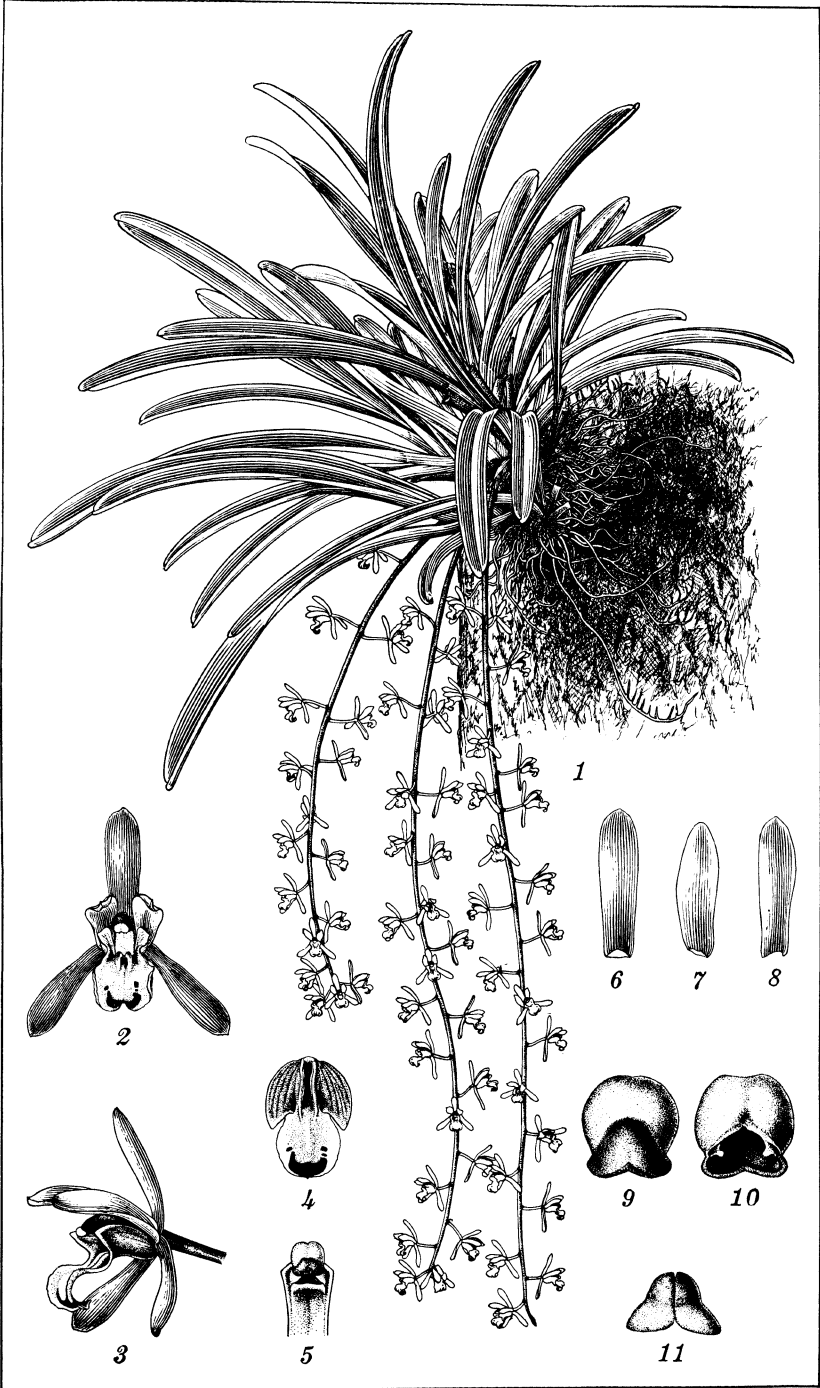


PLATE 3.

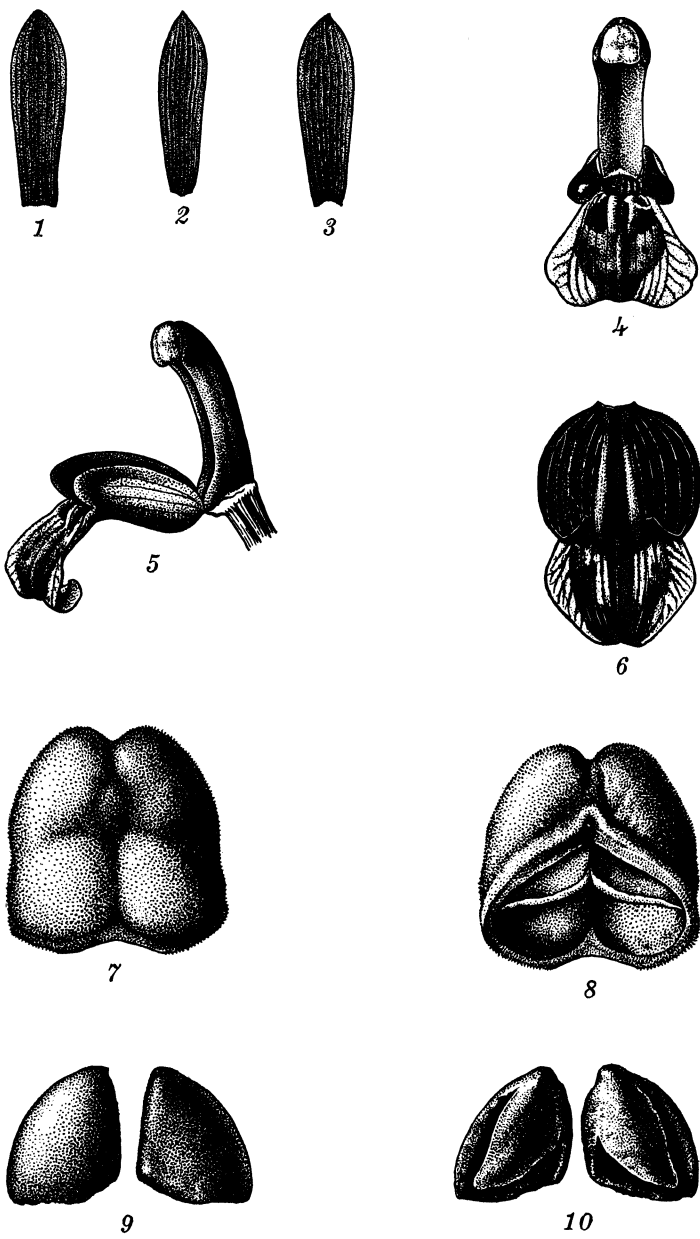
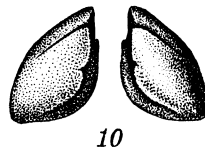
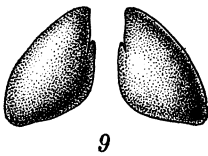
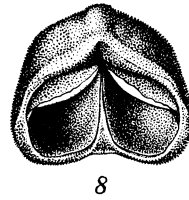
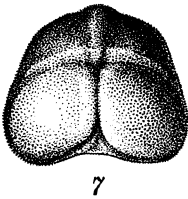
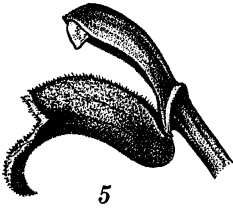


PLATE 4.



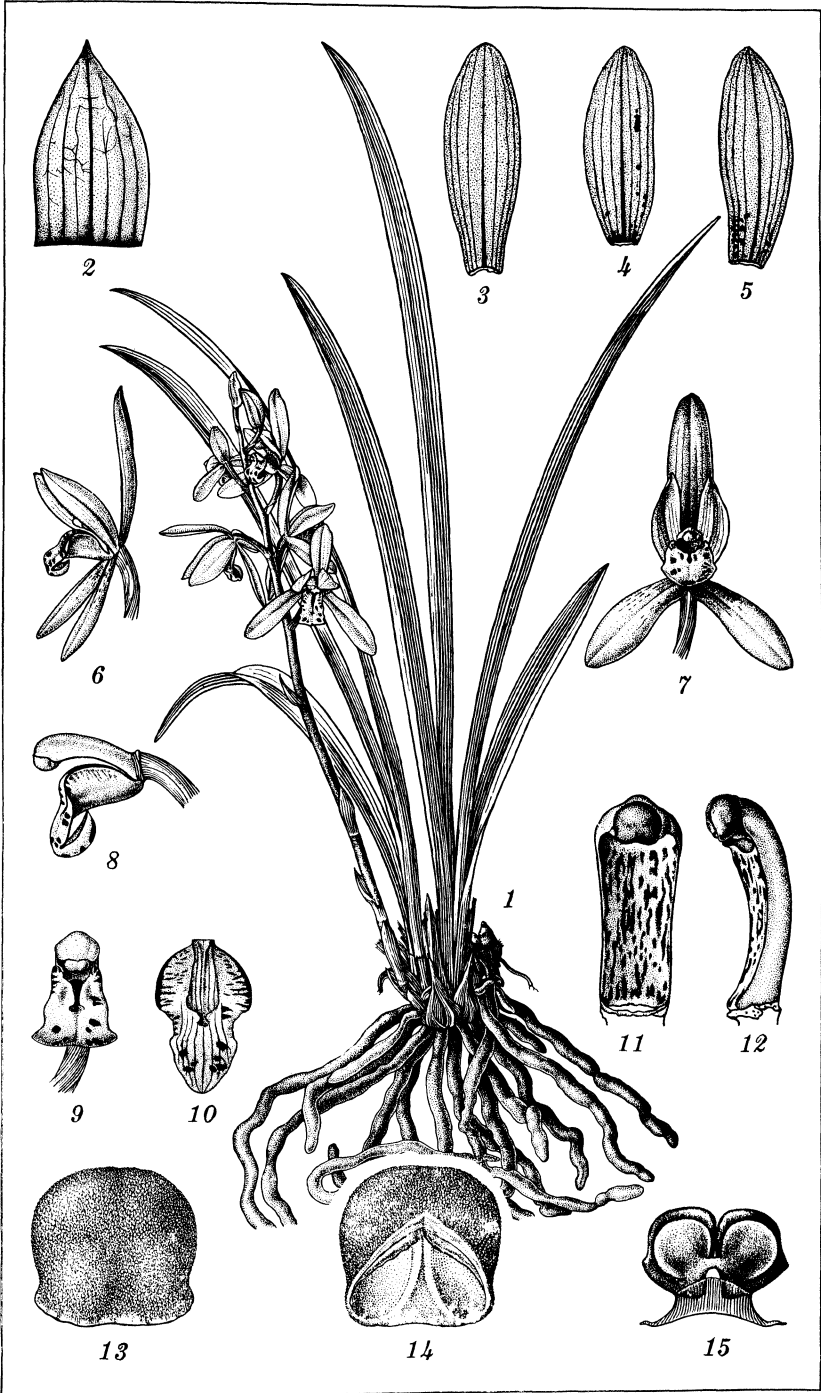


PLATE 6.

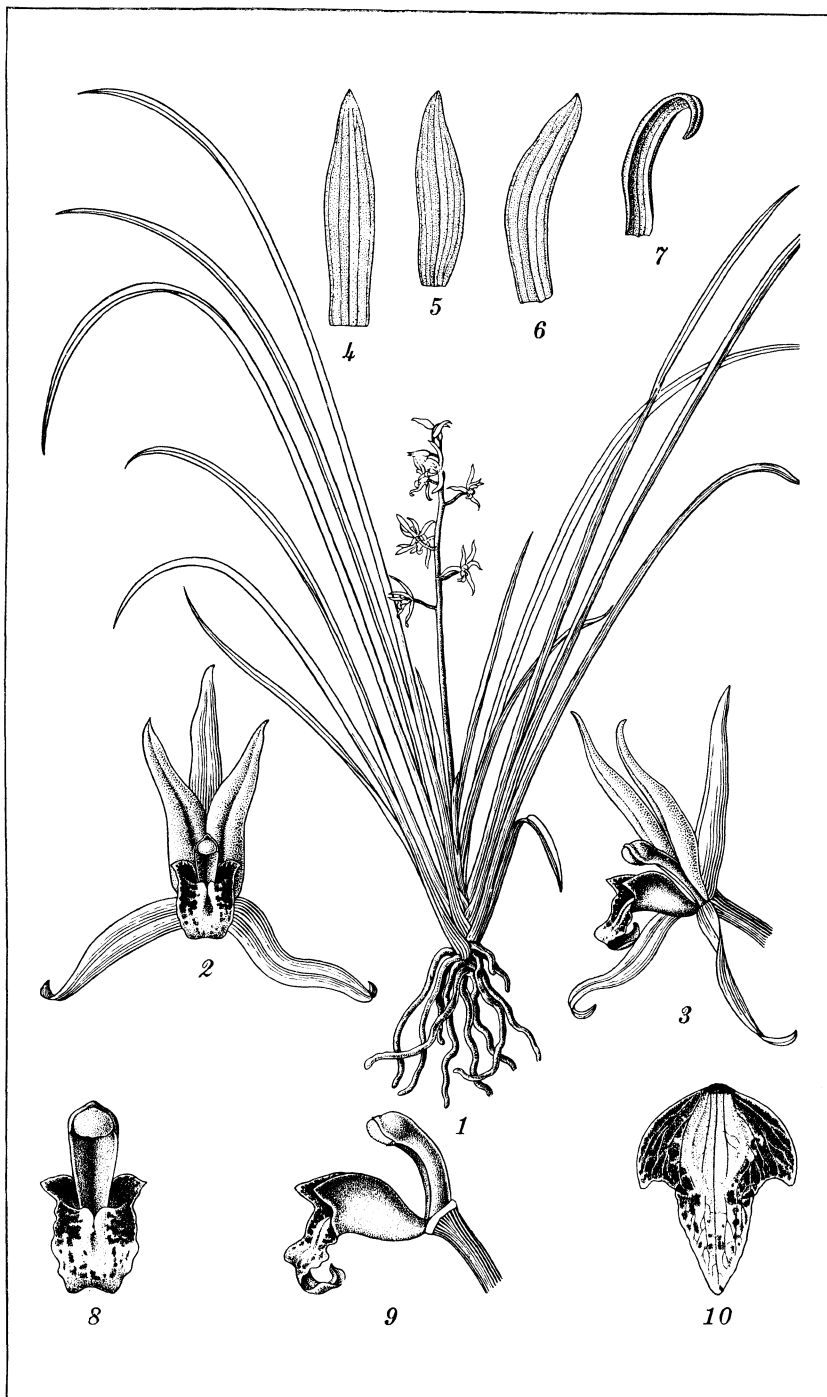


PLATE 7.

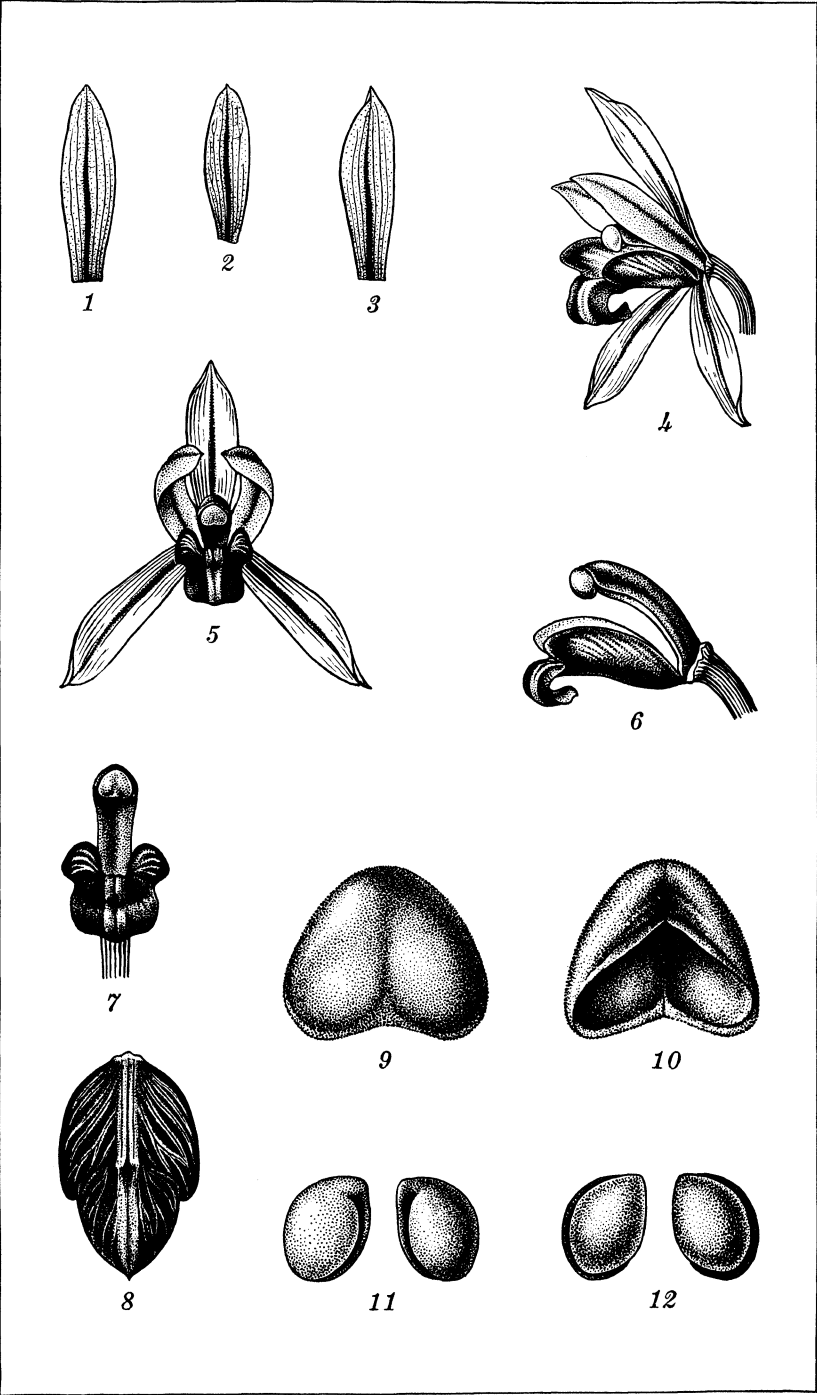


PLATE 8.

BOOKS

Books reviewed here have been selected from books received by the Philippine Journal of Science from time to time and acknowledged in this section.

REVIEWS

The Story of Vitamin B₁. Compiled by C. R. Addinall. Rahway, N. J., Merck & Co., Inc. 1937. 55pp., illus.

This brochure briefly discusses an important dietary element, vitamin B₁. The first part of this book deals with a short historical survey of the different scientific investigations about vitamins which lead finally to the discovery of vitamin B₁. It presents the rapid progress which has been made recently by various scientific researchers on the isolation and identification of this unknown substance, and clearly describes its chemical composition and therapeutic properties. It also illustrates the different biological, chemical, and biochemical processes of assaying vitamin B₁ as it occurs in various materials. It also presents authoritative information regarding the standardization of vitamin B₁ as recommended by the International Conference on Vitamin Standardization. It is of great value to physicians and students of nutrition, for it offers them sufficient data regarding this important substance.

The brochure is illustrated, well indexed, and contains references after each chapter.—P. J. A.

Diseases and Parasites of Poultry. By Edgar Hugh Barger and Leslie Ellsworth Card. 2d ed., thoroughly revised. Philadelphia, Lea & Febiger, 1938. 386 pp., illus. Price, \$3.75.

This book is a valuable treatise on the anatomy and surgery of poultry and the pathology of practically all the diseases and parasites with which the avian family is afflicted. The authors divided their subject matter into fourteen well-organized chapters, each covering a specific phase of the problem. The first five chapters are devoted to preliminary but important considerations in the study of poultry diseases and parasites. In this section of the book the authors brings out the importance and extent of poultry mortality, the nature of poultry diseases, the

anatomy and surgery of the fowl, and diagnostic, preventive, and control methods in the study of the different poultry ailments. The next eight chapters are extensive and well-coördinated discussions on each of the numerous diseases, parasites, and nutritional and physical disorders, grouped according to the nature of their causes. Specific diagnostic directions and preventive and control measures are given in each case. A discussion on the control of flock mortality, which raises several problems directed to either the poultryman or the poultry researcher, forms the concluding chapter of the book. To enhance the usefulness of the book the authors have included a list of classified references at the end of each chapter, effective illustrations throughout, a list of periodicals which regularly or occasionally contain articles on poultry diseases and parasites, an authors' index, and a subject index.

The poultryman, the poultry instructor, and the poultry researcher will find this book an ideal reference.—P. G. R.

The Individual Criminal. Studies in the Psychogenetics of Crime. By Ben Karpman. Volume I, Cases 1 to 5. Washington, D. C., Nervous and Mental Disease Publishing Co., 1935. 317 pp., tables. Price, \$4.50.

Those interested in the psychogenetics of crime should read this very illuminating book by Doctor Karpman. It is a presentation of case studies made by the author, who is one of America's famous psychotherapists, interested in "our doubly unfortunate friends, the criminal Insane". Doctor Karpman's approach to the study of the individual criminal is essentially psychogenetic. In his foreword, he says:

We try to understand a social situation through the study of the individual components. We take here the life history of each individual criminal as it presents itself to us, attempting to trace it to its early beginnings, noting the stages of its development, the influences that shaped its progress, points of arrested development, deviations, and retrogressions. We further attempt not only to describe the phenomena presented, but to find reasons for their appearance and existence; that is, we search for the underlying mechanisms and processes.

There is something more in what the author says that arrests our attention:

In a large sense, we are all born criminals because we are born unconditioned and unrepressed. It is the function of civilization to so train us and direct our tendencies that we are willing to yield a part of ourselves in the service of culture . . . The criminal component which we all seem to have had during the childhood does not disappear entirely from our life as we reach adolescence, but crops out in the numerous irregularities and transgressions of which many of us are often guilty. Many of these

are supposedly within the limits of the normal. The state or government official who in furtherance of his own political ambition appoints to office a friend rather than a stranger who is better qualified, is not only violating the oath of his office, but the better interests of society as well. While there is no law to reach him, I regard him as a criminal nonetheless. The physician who pays unnecessary visits to his patients in order to extract more money from them, not only fails to live up to the best ethics of his profession, but is guilty of behavior essentially criminal in character; as is also the lawyer who deliberately misleads his clients for reasons of personal gain. There are also many other forms of behavior that variously express our criminal tendencies. The coefficient of criminality varies with each one of us and no one knows when his dormant criminality is likely to come to the surface".

The author has so aptly described the genesis of crime, that the reviewer cannot escape the temptation to quote him at length. Those who will find time to go over the pages of this book will be rewarded with a clearer insight into the nature of the individual criminal.—S. G. P.

School for Riding. *A Primer of Modern Horsemanship.* By Sergei Kournakoff. Boston, Hale, Cushman & Flint, 1938. 180 pp., front. illus., appendix. Price, \$2.50.

There are a number of books written on the subject of equitation, and this one by Sergei Kournakoff is most interesting. Its language and style are simple, and there are ample illustrations. The book consists of twelve chapters, each presenting a different phase of riding instructions. As a whole, the book is a very practical aid to those who desire knowledge on practical equitation. It will be useful not only to students but also to those already acquainted with the subject—L. S.

Practical Aspects of Psychoanalysis. *A Handbook for Prospective Patients and Their Advisors.* By Lawrence S. Kubie. New York, W. W. Norton & Co., Inc., 1936. 223 pp. Price, \$2.

This book by Doctor Kubie, written in a very simple style, is a clarification and explanation of the practice of psychoanalysis. Of late there has been a lot of confusion as to the meaning of psychoanalysis, arising from the divergent views of such "psychoanalysts" as Freud, Jung, Adler, Rank, Stekel, and a host of other psychoanalysts. In order to clarify the meaning of psychoanalysis, Doctor Kubie has written this book especially for the layman and physician. Thus Doctor Kubie observes that the term "psychoanalysis" should "be applied only to the method evolved by Freud and to the theories derived from the use of this method. A psychoanalyst is therefore a person who uses Freud's technique, and anyone who does not use this tech-

nique should not be called a psychoanalyst." The book is designed to answer many of the questions that have been asked about the practice of psychoanalysis.

In the Philippines psychoanalysis is as yet unknown, especially to the layman. It is timely therefore that anyone who is interested in the practice of psychoanalysis should read this book.—S. G. P.

Jurisprudence for Nurses. Legal Knowledge Bearing upon Acts and Relationships Involved in the Practice of Nursing. By Carl Scheffel, in Collaboration with Eleanor McGarvah. 2d ed. New York, Lakeside Publishing Co., 1938. 248 pp. Price, \$3.

This book on jurisprudence for nurses will be very helpful to the nursing profession, especially in the present era when human relations are becoming more and more complex everyday. Nurses, like the other members of the community, have certain rights and obligations under the laws of the state. By virtue of their chosen profession they have special rights and are subject to special legal obligations under a set of laws especially created for them. According to the author:

For this reason, the following pages have been written: to enable the nurse to learn how her professional duties are viewed by the law; how an understanding of a few simple legal principles will help her in the business side of her profession; and how she may conduct herself to avoid becoming involved in litigation as the result of practicing nursing.

The material of the book has been embodied in seven chapters, each of which is a discussion of a fundamental legal subject; such as the legal status of nurses, the legal obligations of nurses, nurses and contracts, nurses and wills, the nurse as a witness, the criminal responsibility of nurses, and property rights in clinical charts, case histories, X-Ray films, pathological specimens, records and forms, ownership, possession, uses. There is a long appendix at the end of the book containing numerous samples of nursing legislation. At the end of each chapter questions and problems are given, which will greatly aid teachers and students in case this volume is to be used as a textbook. The answers to these questions and problems are found at the end of the book.

The authors have presented the material in clear and simple language, using technical terms whenever they are necessary. There are profuse citations of decided cases. Many concrete examples are given in order to make clear the point that the authors want to convey. The case of Lorenza Somera, one time

the head nurse of St. Paul's Hospital of Manila, who was convicted for the death of a patient, is extensively discussed.

The authors are well qualified to write this book, Dr. Carl Scheffel being a lawyer and a physician and Eleanor McGarvah a registered nurse.—G. T. L.

The Plough and the Sword. Labor, Land, and Property in Fascist Italy.
By Carl T. Schmidt. New York, Columbia University Press, 1938.
197 pp. Price, \$2.50.

This book should be of current interest to students of rural economics. It describes with vivid effects the basic problems of rural Italy and the measures initiated by the government in overcoming threats of decay and misery riding high in the rural sections of that country, and in restoring faith to an apprehensive rural populace. The steps that Italy took in dissipating the problems of poverty, the problems of food of the nation, soil reclamation, agrarian problems between tenants and landlord, and the like, are lessons worthwhile to Philippine economists who are interested in the present agrarian problems of the Philippines. The change from socialism to fascism in Italian rural reforms is a brilliant example of the plasticity of rural populations, and of the success of Italy's attempt to direct the nation's resources, both of land and sea, for the building of a stable government and a moderately economically progressive population.—H. S. S.

The Stag at Ease. A Cookbook being the Culinary Preferences of a Number of Distinguished Male Citizens of the World. Compiled by Marian Squire. Caldwell, Idaho, The Caxton Printers, Ltd., 1938. 164 pp. Price, \$2.

The presentation of the recipes by the compiler is unique and unconventional. Unlike the recipe book with which the housewife is usually acquainted, this work is entertaining besides being practical. Each recipe included in it is the favorite of a leading figure of American life who introduces the recipe in a few humorous statements and who, in some instances, gives the recipe itself and the direction in preparing the dish. In this way the reader gets first-hand information on the preparation of a number of the unusually appealing dishes. Where such recipes and directions are not given, the compiler supplies them in a most candid manner. Besides giving us an idea of the favorite dishes of the "famous and not famous, but hungry" men of America, the compiler points to possible substitutions that may be made whenever any of the ingredients is not available with

practically no change in the taste of the dish. The housewife will find the book a very good companion in the kitchen.—C. S.

Street Cleaning Practice. By the Committee on Street Cleaning, American Public Works Association, Chicago. Chicago, The Association, 1938. 407 pp., front., illus. Price, \$4.

This book is divided into thirteen chapters and three appendices. As its title suggests, it describes and discusses the different phases of street cleaning practice, the problems met, and their solutions; the different methods and equipment used in various localities in the United States and Europe; planning of the street cleaning system and frequency and more appropriate hours of cleaning the streets; management, records, costs and budgets.

The book is written in very clear language and gives practical suggestions in the practice of street cleaning, which is a very important and necessary activity in a healthy community. It will undoubtedly be a great help to our city engineers, especially to those of the newly created cities in this Commonwealth.—J. G.

Economic Planning and the Tariff. An Essay on Social Philosophy. By James Gerald Smith. Princeton University Press, 1934. 331 pp. Price, \$3.

The whole burden of this book is an able analysis and criticism of the plannings during the greater portion of *laissez-faire* in economics. Tariffs, quotas, subsidies, credits, price fixing, production control, and prohibition of alcoholic drinks were tried as instruments for economic and social control, and all resulted in monopolies and special interests. The author concluded that prohibition, "tariffs, monopolies, and price fixing are quite definitely social evils. It does not matter whether the stabilization schemes are instigated by governments, or by private monopolies, their social effects are mischievous." Let us hope that those who are preoccupied with the above questions read this book. Perhaps, it will deprive them of much of their enthusiasm for some of their plans. Perhaps too, they may avoid some of the pitfalls that lurk ahead.

The author analyzes three forms of economic planning, namely: (1) economic planning without profit, (2) economic planning for profit, and (3) economic planning for general welfare by permitting profit.

He calls the first kind of planning socialistic or communistic. It is based on the view that society is a machine which

would run smoothly, if only the evil, that is, individual greed of members of society, is removed. Society is not a machine, and the evil cannot be easily removed, if at all. Society will continue as it has continued for ages to have the same problems, no matter what form of political organization prevails. This is due to the "existence of variabilities in human psychology and behavior, and in nature's behaviour as well." Man is the result of contradictory attributes.

The second type of planning, that is, for profit, has been a dismal failure as shown by historical evidences, particularly by the events since 1929. It is characterized by bargaining and logrolling tactics in legislation which inevitably result in the creation of special interests and big monopolies.

He extolled the third type of planning, that is, planning for the general welfare "permitting profit as an incentive to individual endeavor." But he warned that too often, this planning degenerates into the second type of planning. He is chary about planning altogether. He says:

The practical operation of social planning results in the pragmatic application of palliatives to solve current impelling social problems. In a democracy the most poorly conceived palliatives prove to be unworkable and are discarded or their enforcement neglected. In a dictatorship they are enforced, usually with unspeakable terrorism and suffering of the masses of the people.

Here is his summary of the ideal conditions on which planning can work. There should be a central authority for social planning, that should have enough of the facts required to make timely judgment. Someone should know well the nature of economic forces. The planning authority should have a broad social outlook, entirely free from personal bias on questions of social conflict, and free from the forces of special interests. Finally, the central authority should have the "power and ability to bring into play promptly and effectively, without cavil of emotion, the actions which its judgment dictates." Otherwise, unfavorable economic forces may go ahead of its plans, and result in chaotic changes. But he failed to advance a working program for the type of planning that he advocates. The nearest to a program is when he asked that all efforts should be bent to the following two directions: "(1) to the education of unbridled individualism towards some measure of self-discipline in the interests of social coöperation: and (2) to the development of adequate means of disciplining recalcitrant individualism which refuses to be self-disciplined."

His real contribution to the subject of planning is his definition of the society in which we live. He said that society is "a product of dynamic psychological individual variabilities in summation,—and social progress is secured by the survival of more desirable variations of individual attributes and social institution." This is a far cry from the mechanistic view of society. If only our plans are candidly reexamined in the light of this view, it is not unlikely that we may some day find our way to the good life.—T. R.

Malaria in the Netherlands. By N. H. Swellengrebel and A. de Buck. Amsterdam, Scheltema & Holkema Ltd., 1938. 267 pp., illus. Price, 10s 6d.

This book is an account of the history and ravages of malaria in the Netherlands, presented in ten chapters. In the opening chapter the authors give a description of the Netherlands as to its geography and topography in relation to the incidence of malaria. They present a comparison of the prevalence of malaria in the past and at present, based on statistics which, unfortunately, are not only incomplete but also inaccurate on account of the lack of adequate knowledge of the disease in the past. The authors give an account of the malaria control work by the use of drugs and of an innovation which they call "sick-clubs." The annual and seasonal variations of malaria and some circumstantial and convincing evidences of its long incubation periods in the Netherlands are brought out. The various species of mosquitos, the preponderance of malaria in that country, caused by *P. vivax*, and the rare or erratic appearance of malignant tertian and other infections caused by other species are discussed in detail. Not only species but also races, with particular reference to the races of *A. maculipennis*, are considered at length. Studies on their cross-breeding and re-cross-breeding which lead to the production of short-winged and long-winged individuals proves very interesting. A discussion on the seasonal reproduction and nutrition of anophelines, which gave rise to gonotropic dissociation and gonotropic concordance and the subsequent variations in anopheline densities due to the occurrence of long and short flights, is a feature of the book that should interest the anopheline specialist.

An extended account of the results of experiments conducted by investigators on malaria infection and the incubation periods of the infective sporozoites is important and should be useful as a check in similar experiments that may be conducted else-

where. The transmission of malaria from mosquito to man and from man to mosquito is very well covered. The authors have devoted a chapter to malaria control. They made instructive comparisons and specific suggestions as to the efficacy of the various control methods advocated. The book also includes studies on malaria induced in patients suffering from general paralysis of the insane.

Physicians and biologists engaged or interested in the study of malaria and its control will find this book a good reference.

—A. E.

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- DOUTHERTY, JOHN WOOLFE.** *Pottery made easy.* New York, The Bruce publishing co., 1939. 179 pp., front., illus. Price, \$2.25.
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- SIEGEL, MORRIS.** *Population, race and eugenics.* Hamilton, Ontario, The author, 1939. 206 pp. Price, \$3.
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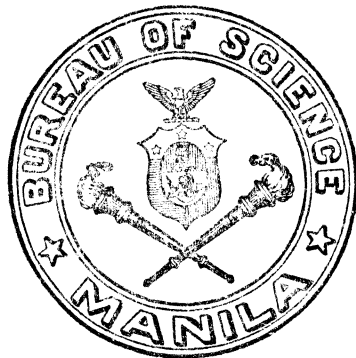
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